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WAR MACHINE

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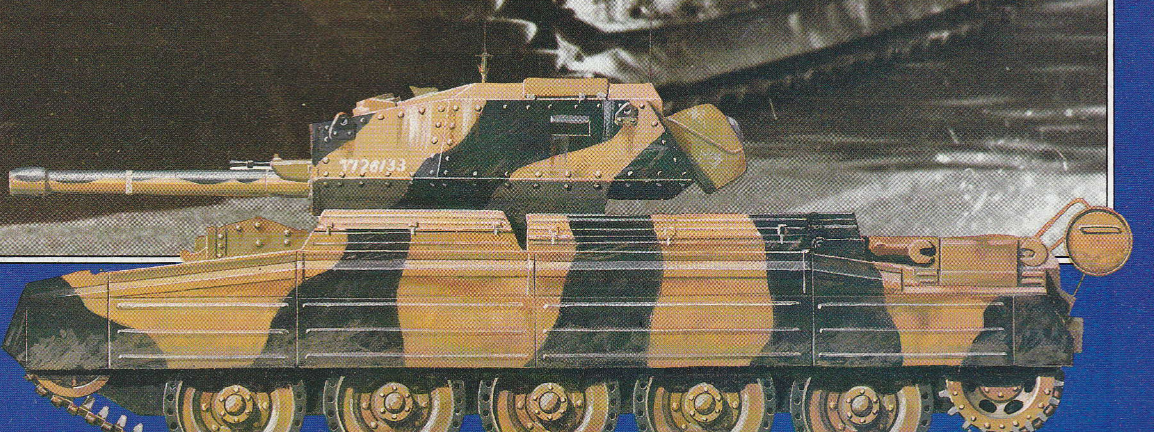

The Moncornet Raid

British Cruiser Tanks

Operation 'Crusader'

A fully illustrated guide to British and French Tanks of World War II

WAR MACHINE

Volume 6 **Issue 67**

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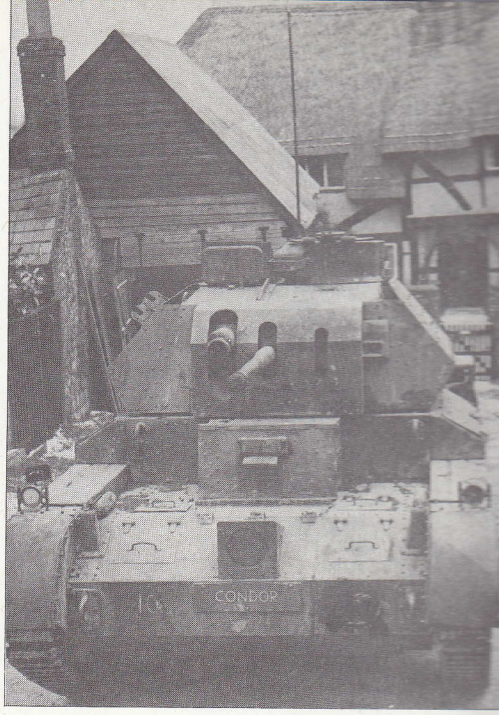
British and French Tanks of World War 11



Insistence that tanks which took the place of cavalry should above all be fast caused British tanks to be thinly protected and inadequately armed. This is a Cruiser Mk IV of the 1st Armoured Division.

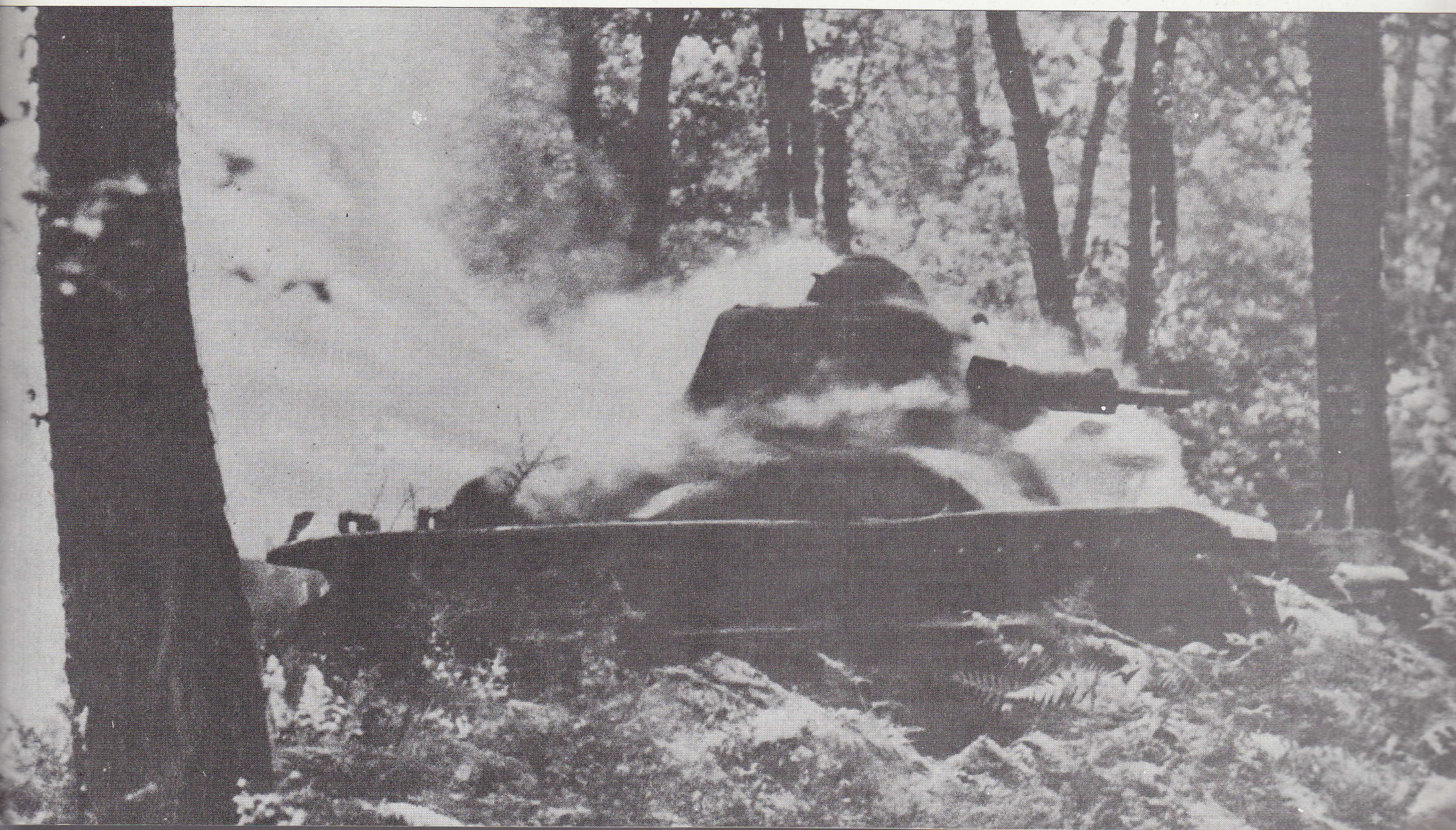
From the birth of the tank in 1916, the British led the world in both the design and use of armoured forces, but by 1939 internal army politics and mistaken tactical doctrine had robbed Britain of this important and hard-won advantage.

The tanks discussed here are among some of the least successful of the World War II period. Some of them (such as the British Valentine, Matilda and Churchill) were eventually turned into good fighting machines, but working in a rush and without a proper development base from which to work up their designs many British tank designers produced tanks that were no match for their counterparts in the German Panzer units. The reasons for this state of affairs are described herein, but it is not all a sorry tale: despite all their drawbacks, these tanks (both Infantry and Cruiser types) were at times all there was to hand and with them their crews and commanders learned the important lessons that were to produce the eventual Allied victory.

Some of the development and design results were remarkable. Working from a base where virtually no heavy engineering facilities existed, Australia was able to produce the Sentinel from scratch, and it was no fault of the designers that their progeny was never to see action. The same can be said of the Canadians, who produced the Ram in a remarkably short time, again from scratch and with no tank production experience whatsoever. These two projects must rate among the more remarkable production feats of World War II, but today they are little known outside their home nations.

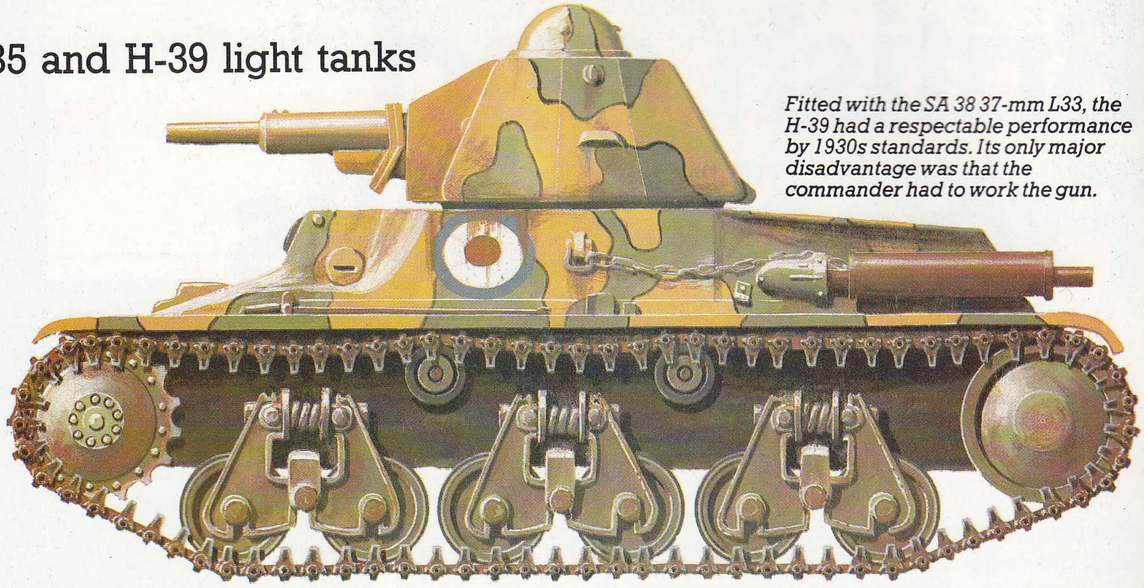
The tale of the Cruiser tanks produced by the United Kingdom has by now been often told but it still bears re-examination of how a doctrine accepted without proper investigation can affect the course of battles, even well past the point when the doctrine has been found wanting. British and Allied tank crews had to drive their charges into battle knowing that their main guns were too weak, their armoured protection too thin and their mechanical reliability all too suspect at a critical moment. But they went into battle all the same and often managed to defeat a better-armed and prepared enemy. Thus while reading of the tanks thought must be given to the men who manned and fought them, for tanks are but lumps of metal constructed in a certain fashion, and are nothing without men to drive and use them in combat.

France had some fine tanks in 1940, but obsession with a defensive strategy left her armoured forces unfit to face the German onslaught. Here a late-model Renault R-35 lies burning as the Blitzkrieg continues.



FRANCE

Hotchkiss H-35 and H-39 light tanks



Fitted with the SA 38 37-mm L33, the H-39 had a respectable performance by 1930s standards. Its only major disadvantage was that the commander had to work the gun.

During the early 1930s the French army, in common with many other European armies, decided to re-equip its ageing tank parks with modern equipment. At that time the French followed the current practice of dividing tank functions into cavalry and infantry usage and one of the new tanks intended for cavalry use was a design known as the **Char Léger Hotchkiss H-35**. But although intended primarily for cavalry formation use, the H-35 was later adopted for infantry support as well, making it one of the more important of the French tanks of the day. The H-35 was a small vehicle with a crew of two, and it was lightly armed with only a 37-mm (1.46-in) short-barrelled gun and a single 7.5-mm (0.295-in) machine-gun. Armour was also light, ranging in the thickness from 12 mm (0.47 in) to 34 mm (1.34 in). It was also rather underpowered, and after about 400 H-35s had been produced from 1936 onwards the basic model was supplemented by the **Char Léger Hotchkiss H-39**, first produced during 1939. The production totals for the H-39 were much greater (eventually running to over 1,000 units), but in general French tank production was slow, being severely limited by a lack of mass production facilities, and was constantly beset by labour troubles, even after 1939.

The H-39 differed from the H-35 in having a 120- rather than 75-hp (89.5- rather than 56-kW) engine, and could be recognized by the raised rear decking, which on the H-39 was almost flat compared with the pronounced slope on the H-35. Also a new and longer 37-mm gun was fitted, but this was only marginally more powerful than the earlier weapon and soon proved to be virtually useless against most German tanks.

Both the H-35 and the H-39 were used in action in France in May 1940, and both were able to give a good account of themselves. However, their part in the fighting was more than diminished by their dismal tactical use. Instead of being used en masse (in the way that the Germans used their Panzer columns), the French tanks were scattered along the line in penny packets, assigned to local infantry support instead of being used as an effective anti-armour force and were able to make little impact. On occasion they were able to surprise the Germans, but only in purely local actions, so many were either destroyed or captured by the advancing Germans. Always short of matériel, the Germans took many Hotchkiss tanks into their own service as the **PzKpfw 35-H 734(f)** and **PzKpfw 39-H 735(f)**, and these were used for some years by second-line and occupation units. Many of the H-35 and H-39 tanks later had their turrets removed and replaced by German anti-tank guns for use as mobile tank destroyers.

Not all the French tanks fell into German hands. Many were located in the French Middle East possessions and some were either taken over by the Free French or were used in action by the Vichy French during the campaign in Syria in 1941. Perhaps the Hotchkiss tanks with the most unusual travel tales were those taken by the Germans to the Soviet Union in 1941, when they were so short of tanks that even the captured French vehicles were found useful.

By 1945 there were few H-35s or H-39s left anywhere: the Middle East examples survived in small numbers, and post-war some were used to form part of the Israeli army tank arm, remaining in service as late as 1956.

H-35s, seen here on parade, equipped many French mechanized cavalry units. Although armed with the ineffectual SA 18 37-mm L21, they could still have performed effectively in the reconnaissance role but instead were deployed piecemeal to bolster the infantry.

Specification

Hotchkiss H-39

Crew: 2

Weight: 12.1 tonnes

Powerplant: one Hotchkiss 6-cylinder petrol engine developing 120 hp (89.5 kW)

Dimensions: length 4.22 m (13 ft 10 in); width 1.95 m (6 ft 4.8 in); height 2.15 m (7 ft 0.6 in)

Performance: maximum road speed 36 km/h (22.3 mph); maximum road range 120 km (74.5 miles); fording 0.85 m (2 ft 10 in); gradient 40°; vertical obstacle 0.50 m (1 ft 8 in); trench 1.80 m (5 ft 11 in)

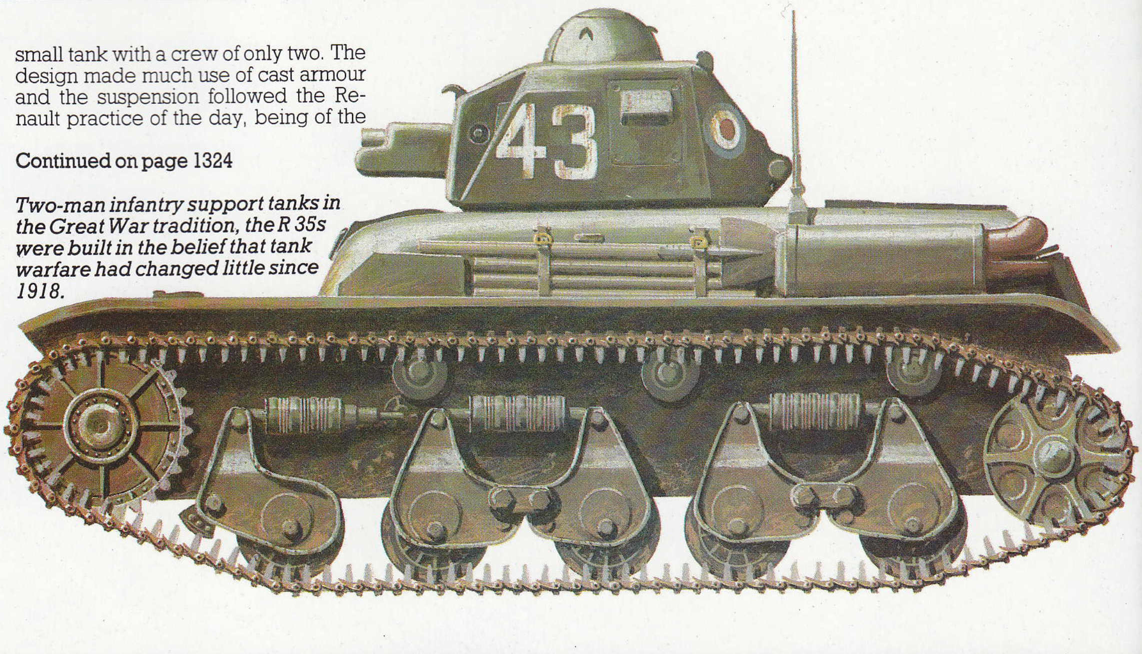
FRANCE

Renault R 35

The **Renault R 35** had its origins in a design known originally as the **Renault ZM**, produced in late 1934 in answer to a French army request for a new infantry support tank to supplement and eventually replace the ageing Renault FT 17 which dated back to World War I. Trials of the new tank started in early 1935, and in that same year the design was ordered into production without completion of the testing as Germany appeared to be in a mood for conflict. Before production got under way it was decided to increase the armour basis from 30 mm (1.18 in) to 40 mm (1.575 in).

The R 35 never entirely replaced the FT 17 in service, but by 1940 over 1,600 had been built and it was the most numerous French infantry tank in use. Its overall appearance was not unlike that of the FT 17, for it was a small tank with a crew of only two. The design made much use of cast armour and the suspension followed the Renault practice of the day, being of the

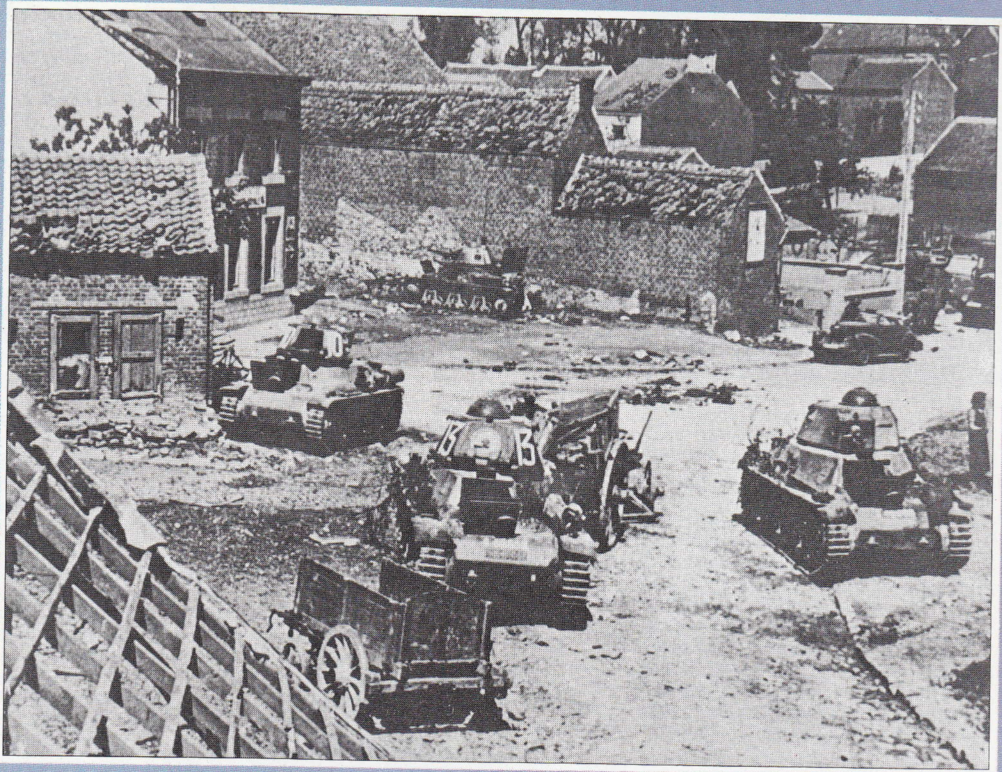
Continued on page 1324



Two-man infantry support tanks in the Great War tradition, the R 35s were built in the belief that tank warfare had changed little since 1918.

The Moncornet Raid

Despite the different currents of military thought in the 1930s, the spectre of Verdun loomed large in the minds of French defence planners. Convinced of the futility of offensive warfare, armour had only a supporting role in French tactics.



French armour was all too often deployed in penny packets, making easy meat for the German tanks. Here, Hotchkiss H-35s and H-29s litter a street in eastern France, unable to stem the remorseless advance of the Panzers.

To a generation of French men and women the name Charles de Gaulle has a ring that conjures up many memories, but to most he is still best remembered as the man who rallied the Free French in the dark days that followed the German occupation of France in 1940. But even before that de Gaulle was well known in military circles as he was one of the few men in the French army who read and absorbed the military thinkings of Liddell Hart and Fuller and who had been active in calling for armoured formations similar to those being built up in Germany. In a military world that was content to wait behind the Maginot Line his calls went unheeded, but gradually de Gaulle gained in personal influence to the point where he was offered a political post in the French wartime government.

De Gaulle refused the post, and instead severed his connections with the military staffs and returned to his tank regiments. He was still only a colonel but he was soon in a position to oversee the formation of the few armoured units that the French army was able to assemble. These were few enough (and belated at that), and were only a hollow shell of what they were supposed to be. Most tank forces were retained in their various 'infantry' and 'cavalry' support functions for the bulk of the army, including the large forces kept static behind the Maginot Line, so the new armoured divisions and brigades had to be formed from whatever units were left over. Equipment was sparse, the tanks involved were usually slow and undergunned and all the time the armoured commanders had to fight against the apathy and conservatism of the established staffs.

When the Germans attacked France in May 1940 the new armoured divisions existed on paper only. What units there were lacked training, guidance and equipment, and even they were immediately split up into penny packets to try to plug gaps as they occurred. The Panzers brushed such small units aside in their headlong rush across the Meuse and the north French plain but by 17 May the German advances had become so great that the Panzer commanders were ordered to halt. It was at this point that de Gaulle was given his order to make an attack across the neck of the Panzer advance.

In effect de Gaulle was to strike north across the German 'neck' while another armoured force was to strike south towards him. The plan was overambitious from the start (for example, the attack from the north never even started). It is now difficult to describe the lethargy and lack of comprehension of armoured warfare that beset the French military establishment in those days, but the German attack put logical thought and planning to flight. The French command degenerated into a state of what can now only be described as defeatism that soon filtered down through the ranks to the ordinary soldiers who simply gave up any idea of fighting. Not all French units were affected by this thinking, but many were and this factor made itself apparent during de Gaulle's attack.

De Gaulle had taken command of the 4th Armoured Division, but the division hardly existed. When he arrived at his post de Gaulle found only a smattering of tank units, an embryo staff and a rabble of refugees and combat-weary soldiers. But he decided to strike north from his location to the north east of Soissons towards Moncornet, which was then some 32 km (20 miles) behind the German lines, such as they were at that stage of the campaign. For this attack he could muster no more than three battalions of tanks, of which two had the small infantry Renault R-35s armed only with a short 37-mm gun; the third battalion had one company of the excellent Char D-2, but the other companies were newly formed, ill-trained and their tanks had only long 37-mm guns. In addition to this tank force there was one battalion of infantry carried in commandeered buses, but virtually no artillery, no air support and no anti-aircraft defences.

For all this de Gaulle set out on the morning of 17 May with the division forcing its way through columns of hapless refugees. En route to Moncornet the French tanks ran into little opposition until they overran an unprepared German reconnaissance unit in a village called Chivres. There a short sharp action knocked out the German unit in exchanges of machine-gun fire and a few rounds from the tank guns. Soon after a line of German 'B' vehicles were set on fire in a spectacular bonfire and Moncornet lay ahead.

Unbeknown to de Gaulle Moncornet was the headquarters of the XIX Panzer Corps' 1st Panzer Division. The arrival of the French tanks caused a state of mild panic for the rear-area soldiers were virtually unprepared for the arrival of the enemy in their midst, but it was not long before some active officers got things moving. One immediately took control of a few German tanks emerging from a field workshop and sent them towards the attackers, who seemed equally unprepared for their arrival. German anti-aircraft guns started to spray fire towards the French and a few anti-tank guns were rushed into position. Soon French tanks were in flames and the infantry units either debussed and scattered or turned and withdrew. German self-propelled guns started to join in the melee and the French tanks simply turned to the rear and made their way back to their starting point. En route they were constantly harassed by the ubiquitous Stuka dive-bombers and all the way the French tanks were engaged by various enterprising local units.

At best de Gaulle's venture through the German lines to Moncornet could be described as an armoured raid. It certainly was not an attack that was supposed to sever the German 'neck'. Not only was it totally lacking in numbers and supporting arms, such as infantry and artillery, but its counterpart attack from the north never even got beyond the planning stage. At best it was nothing more than a nuisance to the Germans who continued their advances quite unaffected. But for all this the raid on Moncornet assumed an importance in the de Gaulle legend out of all proportion to its military worth, as did a similar raid carried out a few days later in the direction of Laon. That too was made in weak strength with virtually no support and without any definite purpose, but the two raids became in the minds of many the point of conflict between two masters of armoured warfare, de Gaulle and Guderian. In fact Guderian took no part in the repulsing of either raid. That was left to his subordinates, but de Gaulle's efforts did at least strike many as being at least an effort to retaliate against an enemy carrying all before him and a gesture of defiance from a French army that was defeated even before the German invasion began.

type used on the Renault cavalry tank designs. The driver's position was forward, while the commander had to act as his own loader and gunner firing a 37-mm (1.456-in) short-barrelled gun and co-axial 7.5-mm (0.295-in) machine-gun mounted in a small cast turret. This turret was poorly equipped with vision devices and was so arranged that the commander had to spend much of his time in action standing on the hull floor. Out of action the rear of the turret opened as a flap on which the commander could sit.

For its day the R 35 was a sound enough vehicle, and was typical of contemporary French design. In 1940 a version with a revised suspension and known as the **AMX R 40** was introduced, and a few were produced before the Germans invaded in May 1940. The little R 35s soon proved to be no match for the German Panzers. For a start they were usually allocated in small numbers in direct support of infantry formations, and could thus be picked off piecemeal by the massed German tanks. Their gun proved virtually ineffective against even the lightest German tanks, though in return their 40-mm (1.575-in) armour was fairly effective against most of the German anti-tank guns. Thus the R 35s could contribute but little to the course of the campaign and many were either destroyed or simply abandoned by their crews in the disasters that overtook the French army as the Germans swept through France.

Large numbers of R 35s fell into German hands virtually intact. These were duly put to use by various garrison units in France while many eventually passed to driver and other tank training schools. With the invasion of the Soviet Union many R 35s were stripped of their turrets and used as artillery tractors or ammunition carriers. Later, many of the R 35s still in France had their turrets removed so that their hulls could be converted as the basis of several self-propelled artillery or anti-tank gun models, the turrets then being emplaced in concrete along the coastal defences of the Atlantic Wall.

Thus the R 35 passed into history, and despite its numbers its combat record was such that it proved to be of more use to the Germans than the French.

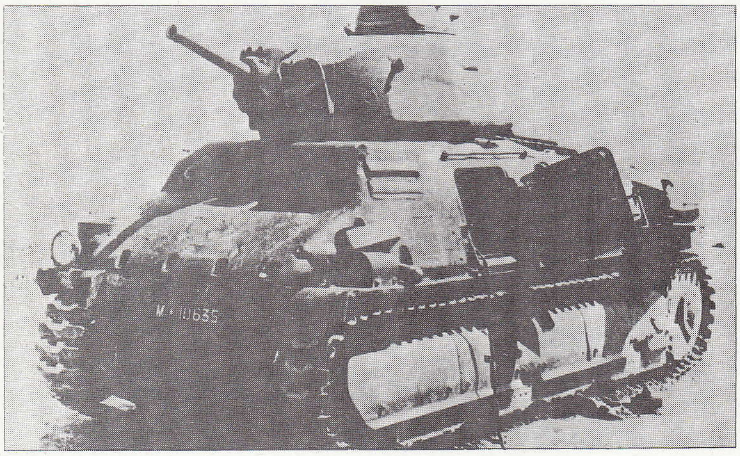
Specification

Renault R 35
Crew: 2
Weight: 10000 kg (22,046 lb)
Powerplant: one Renault 4-cylinder petrol engine developing 61 kW (82 bhp)
Dimensions: length 4.20 m (13 ft 9.25 in); width 1.85 m (6 ft 0.75 in); height 2.37 m (7 ft 9.25 in)
Performance: maximum speed 20 km/h (12.4 mph); range 140 km (87 miles); fording 0.8 m (2 ft 7 in); vertical obstacle 0.5 m (1 ft 7.7 in); trench 1.6 m (5 ft 3 in)

FRANCE

SOMUA S-35 medium tank

When the re-equipment of the French cavalry arm with tanks started during the mid-1930s several concerns became involved, among them a Schneider subsidiary in St Ouen and known as the Société d'Outillage Mécanique et d'Usinage d'Artillerie, better known as SOMUA. In 1935 this concern displayed a tank prototype that attracted immediate attention, and its very advanced design was quickly recognized by the award of a production order. One of the best if not the best AFV of its day, the type was known as the **SOMUA S-35** to most of Europe though to the French army it was the **Automitrailleuse de Combat (AMC) modele 1935 SOMUA**.



In 1940 many SOMUAs were damaged and abandoned like the one seen here, but the vehicle was good enough for the Germans to use against the Allies four years later.

The S-35 had many features that were later to become commonplace. The hull and turret were both cast components at a time when most contemporary vehicles used riveted plates. The cast armour was not only well-shaped for extra protection but it was also much thicker (minimum of 20 mm/0.79 in and maximum of 55 mm/2.16 in) than the norm for the time. For all that it still had a good reserve of power provided by a V-8 petrol engine for lively battlefield performance, and a good operational radius of action was ensured by large internal fuel tanks. Radio was standard, at a time when hand signals between tanks were still common. To add to all these advantages the S-35 was armed with a powerful gun: the 47-mm (1.85-in) SA 35 was one of the most powerful weapons of the day and a gun that could still be regarded as a useful weapon in 1944. The secondary armament was a single 7.5-mm (0.295-in) co-axial machine-gun.

The S-35 was ordered into production but, as in nearly all other sectors of the French defence industry before 1939, this production was slow and beset by labour and other troubles. Only about 400 S-35s had been produced by the time the Germans invaded in May 1940, and of those only about 250 were in front-line service. But in action the S-35 gave a good account of itself though revealing a serious design defect when under fire: the upper and lower hull halves were joined by a ring of bolts along a horizontal join, and if an anti-tank projectile hit this join the two halves split apart with obvious dire results. But at the time this mattered less than the way in which the tanks had to be handled: the S-35 had a crew of three (driver, radio operator and commander), and it was the commander in his one-man turret who caused the problems, for this unfortunate had not only to keep an eye on the local tactical scene, but also to assimilate orders from the radio while loading and firing the gun. The tasks were too much for one man, so the full potential of the S-35 was rarely attained. As with other French tanks of the day the S-35s were split into small groups scattered long the French line and were called together on only a few occasions for worthwhile counterstrokes against the Panzer columns.

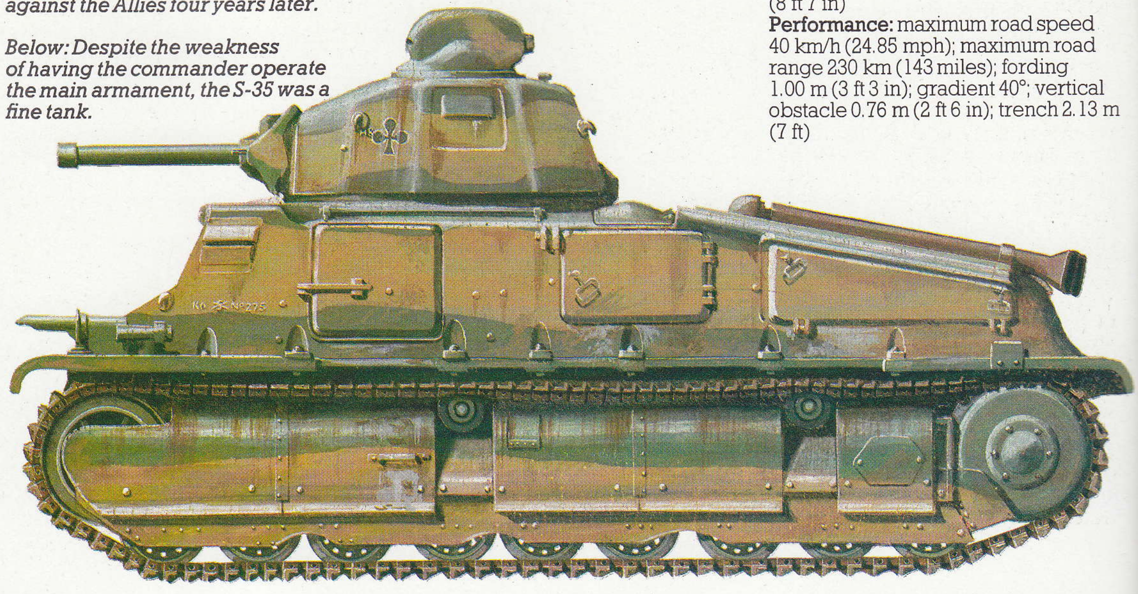
After the occupation of France the Germans took over as many S-35s as they could find for issue to occupation and training units under the designation **PzKpfw 35-S 739(f)**. Some were handed over to the Italian army, but many were still based in France when the Allies invaded in 1944 and S-35s were once more in action, this time in German hands. Any S-35s taken by the Allies were passed over to the Free French, who in their turn used them in the reduction of the beleaguered German garrisons locked up in their Atlantic sea-port strongholds.

Well protected and manoeuvrable, the SOMUA S-35 was undoubtedly the best Allied tank in 1940. It had a radio and its 47-mm gun could fire both armour-piercing shot and high explosive, an obvious requirement which had escaped British designers.

Specification

SOMUA S-35
Crew: 3
Weight: 19.5 tonnes
Powerplant: one SOMUA V-8 petrol engine developing 190 hp (141.7 kW)
Dimensions: length 5.38 m (17 ft 7.8 in); width 2.12 m (6 ft 11.5 in); height 2.62 m (8 ft 7 in)
Performance: maximum road speed 40 km/h (24.85 mph); maximum road range 230 km (143 miles); fording 1.00 m (3 ft 3 in); gradient 40°; vertical obstacle 0.76 m (2 ft 6 in); trench 2.13 m (7 ft)

Below: Despite the weakness of having the commander operate the main armament, the S-35 was a fine tank.



FRANCE

Char B1-bis heavy tank

The series of tanks known as the **Char B** had a definite look of the 'Great War' era about them, and this is not surprising for their development can be traced back as far as 1921 and the aftermath of World War I. What was demanded at that time was a tank with a 75-mm (2.95-in) gun set in a hull-mounted embrasure, but it was not until about 1930 that the result of this request was finally built. This was the Char B heavy tank with a weight of about 25 tonnes, and prolonged development led in 1935 to the full production version, the **Char B1**.

The Char B1 was a powerful tank for the period as it had a turret-mounted 47-mm (1.85-in) gun and a 75-mm (2.95-in) gun set in the lower hull front. The limited traverse of this latter gun was partially offset by a complex steering system that allowed the vehicle to be rapidly pointed towards the correct target sector. Although its archaic appearance belied the fact, the Char B was full of very advanced design features that ranged from self-sealing fuel tanks to grouped lubrication for the many bearings; an electric starter was also provided and attention was given to internal fire protection. However, the crew of four men was scattered about the interior in a way that made internal communication difficult, and this led to many operational problems. The crew of the Char B1 had to be a highly-trained group of specialists to make the best of the vehicle's potential fighting value, and in 1940 these teams were few and far between.

The final production model was the **Char B1-bis** which had increased armour (maximum and minimum of 65 and 14 mm/2.56 and 0.55 in compared with the Char B1's 40 and 14 mm/1.57 and 0.55 in), a revised turret design and a more powerful engine. Later production models had an even more powerful aircraft engine and extra fuel capacity. Production of the Char B1-bis started in 1937, and by 1940 there were about 400 Char Bs of all types in service. By then the Char B1 and Char B1-bis were the most numerous and powerful of all the French heavy tanks, and the basic type was the main battle tank of the few French armoured formations.

The Germans had a great respect for the Char B1, for the 75-mm (2.95-in) gun was quite capable of knocking out even their PzKpfw IV, but they were considerably assisted during the May 1940 fighting by several factors. One was that the Char B1s were complex beasts and required a great deal of careful maintenance: many simply broke down en route to battle and were left for the Germans to take over undamaged. The type's combat potential was somewhat lessened by the need for a well-trained crew and by the usual drawback in French design and usage of the commander having to serve the gun as well as command the tank and crew. The final drawback for the French was that, as was the case with other tank formations, the Char B1 units were frequently broken up into small local-defence groups instead of being grouped to meet the German tank advances.

The Germans took over the Char B1-bis as the **PzKpfw B1-bis 740(f)** and used it for a variety of purposes. Some were passed intact to occupation units such as those in the Channel Islands, while others were converted for driver training or were altered to become self-propelled artillery carriages.

The Char B1 was easily able to deal with any German tank in existence, but abysmal handling rendered it largely ineffective.

Some were fitted with flamethrowers as the **PzKpfw Flamm(f)**. In 1944 a few were still around to pass once more into French army use but by 1945 only a handful were left.

Specification

Char B1-bis

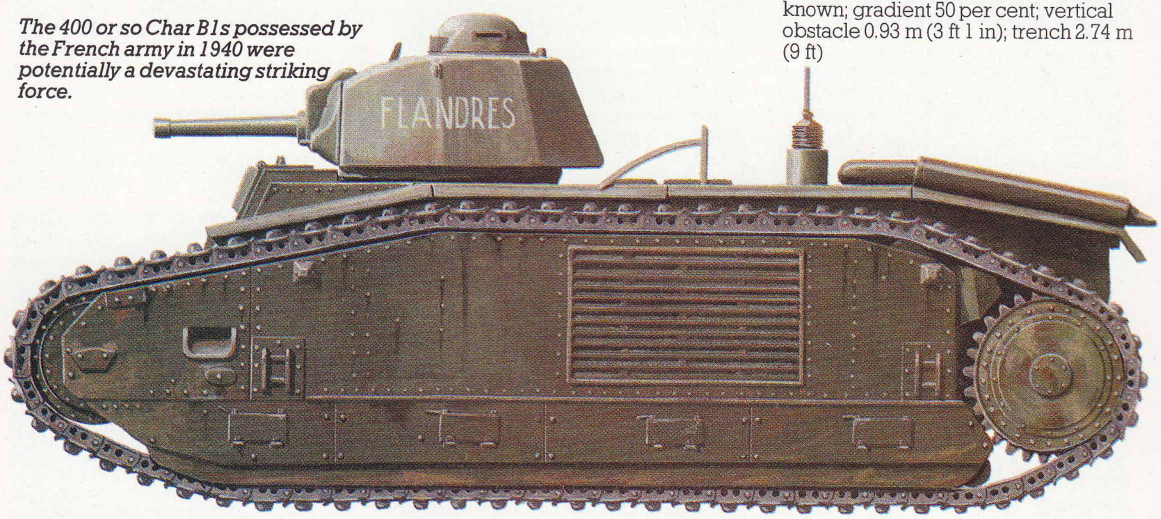
Crew: 4

Weight: 31.5 tonnes

Powerplant: one Renault 6-cylinder petrol engine developing 307 hp (229 kW)

Dimensions: length 6.37 m (20 ft 10.8 in); width 2.50 m (8 ft 2.4 in); height 2.79 m (9 ft 1.8 in)

Performance: maximum road speed 28 km/h (17.4 mph); maximum road range 180 km (112 miles); fording not known; gradient 50 per cent; vertical obstacle 0.93 m (3 ft 1 in); trench 2.74 m (9 ft)



The 400 or so Char B1s possessed by the French army in 1940 were potentially a devastating striking force.

UK

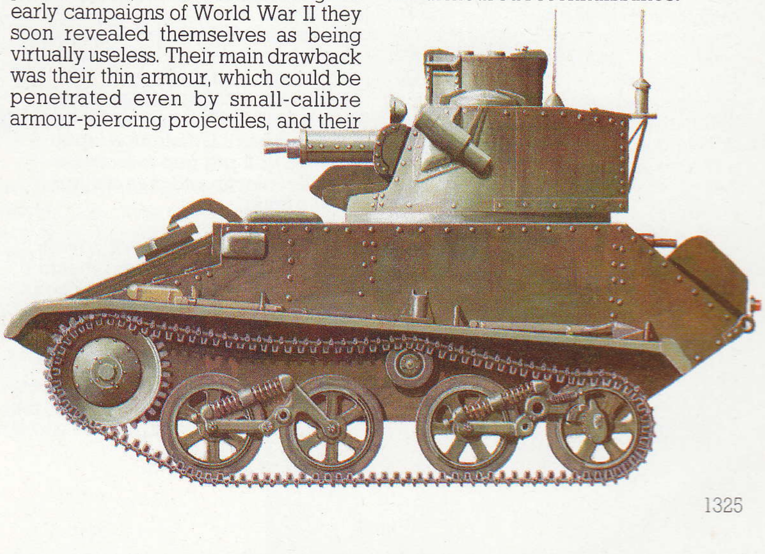
Vickers Light Tanks

The **Vickers Light Tanks** had their origins in a series of tankettes designed and produced by Carden-Loyd during the 1920s. The story of these little vehicles is outside the scope of this account but one of them, the **Carden-Loyd Mk VIII**, acted as the prototype for the **Vickers Light Tank Mk I**. Only a few of these innovative vehicles were produced and issued, but they provided a great deal of insight into what would be required for later models. The Mk I had a two-man crew and had a small turret for a 7.7-mm (0.303-in) machine-gun.

The Mk I led via the **Light Tank Mk IA** (better armour) to the **Light Tank Mk II** (improved turret and modified suspension) which appeared in 1930, and this formed the basis for later versions up to the **Light Tank Mk VI**. All these light tanks used a simple hull with riveted armour which was of the order of 10 to 15 mm (0.39 to 0.59 in) thick. From the **Light Tank Mk V** onwards the turret was enlarged to take two men, making a three-man crew in all, and the same mark also saw the introduction of a 12.7-mm (0.5-in) machine-gun alongside the original 7.7-mm (0.303-in) weapon. Of course there were changes between all the various marks: for instance the **Light Tank Mk IV** was the first to use the armour as supporting plates for the chassis, rather than the other way round, and changes were made to the suspension to improve cross-country performance. With the Mk VI the light tanks came to the peak of their development and were agile vehicles capable of a nifty cross-country speed, and were up-armed to the point where the **Light Tank Mk VIc** had a 15-mm (0.59-in) heavy machine-gun in the turret. All manner of changes to items such as engine cooling and vision devices were also introduced on this late mark, and even the machine-gun was changed to the new Besa 7.92-mm (0.312-in) machine-gun of Czech origins.

The Vickers Light Tanks were widely used throughout the 1930s and the early war years. Many of the early marks were used in India and for imperial policing duties, in which they proved ideal, but in action during the early campaigns of World War II they soon revealed themselves as being virtually useless. Their main drawback was their thin armour, which could be penetrated even by small-calibre armour-piercing projectiles, and their

Mounting a 0.50-in and later a 15-mm BESA machine-gun with a co-axial 7.92-mm machine-gun, the Vickers Light Tank was an adequate vehicle for armoured reconnaissance.



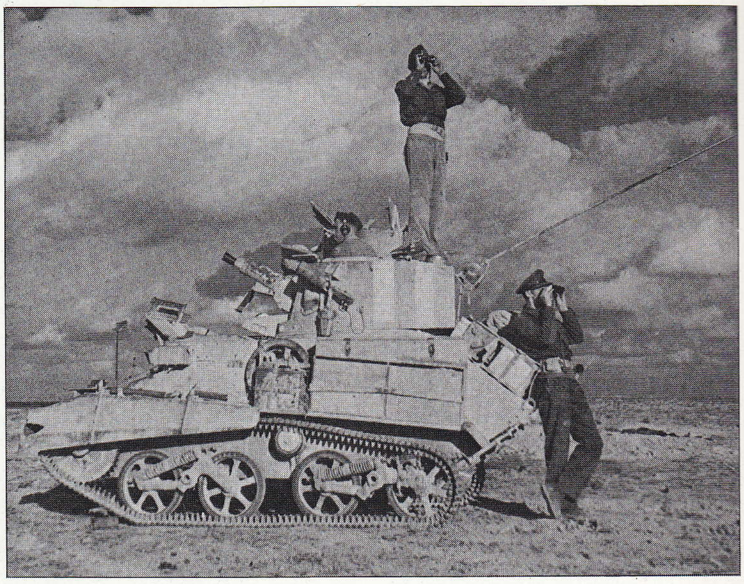
lack of a weapon heavier than a machine-gun. In France in 1940 they were frequently incorrectly deployed as combat tanks and suffered accordingly, for they were only reconnaissance vehicles. Their light armour and lack of an offensive weapon made them of little use for anything else, but in 1940 the lack of numbers of tanks on the ground often meant that they were rushed into action against the German Panzers with disastrous results.

The Light Tanks remained in use in the North African desert campaigns for some time until replacements came along. Back in the United Kingdom the later marks were often used for trials. One of them was an attempt to convert some of the otherwise wasted vehicles into anti-aircraft tanks, mounting either four 7.92-mm (0.312-in) or two 15-mm (0.59-in) machine-guns, but although some conversions were made they saw little use. Other attempts were made to fit a 2-pdr (40-mm/1.58-in) anti-tank gun in an enlarged turret, but that idea was not pursued.

Surprisingly enough, the Germans in France were happy to use any Light Tanks they could recover, not as battle tanks but as anti-tank gun carriers, but only small numbers are believed to have been so converted.

Specification

Light Tank Mk V
Crew: 3
Weight: 4877 kg (10,752 lb)
Powerplant: one Meadows ESTL 6-cylinder petrol engine delivering 66 kW (88 bhp)
Dimensions: length 3.96 m (13 ft); width 2.08 m (6 ft 10 in); height 2.235 m (7 ft 6 in)
Performance: maximum speed 51.5 km/h (32 mph); range 201 km (215 miles)



After suffering heavy losses in France when mistakenly used in close support of the infantry, the MK VI soldiered on in the Middle East and North Africa.

UK

Light Tank Mk VII Tetrarch

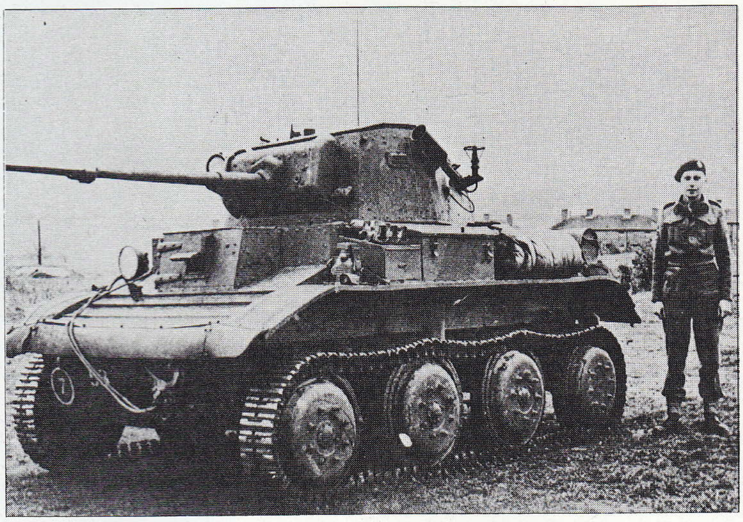
The **Tetrarch** light tank started its life as the **Light Tank Mk VII**, and was a Vickers private-venture project to continue its line of light tank designs. That was in 1937, and the first prototype started its trials in 1938. These trials demonstrated that the new design, known at that time as the **Purdah**, lacked any of the attributes that would make it an outstanding weapon; but the type offered some potential, and it was decided to undertake further testing pending a possible production contract.

In its initial form the **Purdah**, later designated the **A17**, and later still the Tetrarch, differed from the earlier light tanks by having four large road wheels on each side. A two-man turret was centrally mounted, and this turret was large enough to mount a 2-pdr (40-mm/1.58-in) gun with co-axial 7.92-mm (0.312-in) machine-gun. Various alterations were demanded once the prototype had completed its initial trials, notably to engine cooling and for provision of more fuel tanks to improve range. Eventually the Tetrarch was put into production without any great enthusiasm, but it was at least something ready to hand at a period when the British army had few tanks of any kind to put into the field. Light tanks were recognized as a liability in action by 1941, however, so the few that were completed became surplus to requirements other than for limited operations such as the invasion of Madagascar in May 1942. Numbers of Tetrarchs were even handed over to the Soviet Union.

But the fortunes of the Tetrarch changed with the establishment of the airborne forces, and it was not long before the lightweight Tetrarch was accepted as the army's first airborne tank. A new glider, the General Aircraft Hamilcar, was designed and produced as the airborne carrier for the Tetrarch, but it was not until April 1944 that the first trial landings were made, some of them being spectacular in the extreme. For their new role the turrets were fitted with a 76.2-mm (3-in) infantry support howitzer, the vehicle being redesignated **Tetrarch ICS**.

The Tetrarchs went into action during the Normandy landings of 6 June 1944 during the second airborne wave. Most of them landed near the River Orne, where their combat life was short. They were next used during the Rhine crossings on 24 March 1945, but only a few were used during that event as their numbers had been supplemented by the American M22 Locust. That marked the limits of the type's airborne operational career, but some were retained for a few years after the war until their Hamilcar gliders were withdrawn from service.

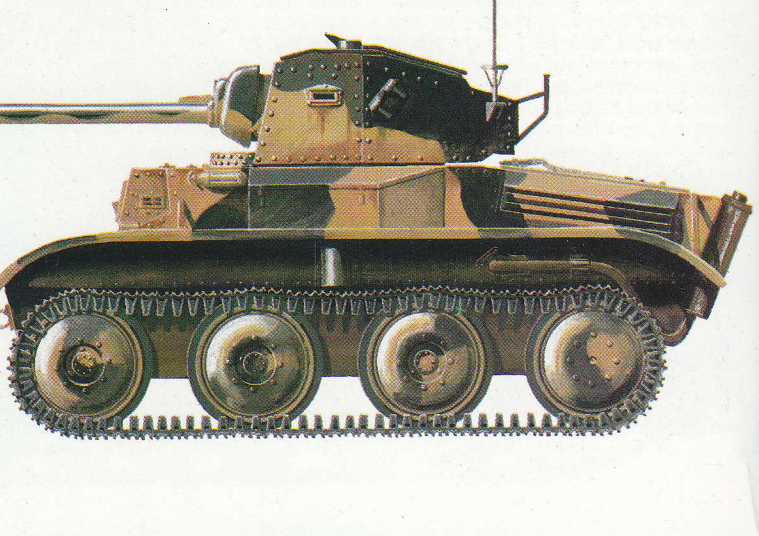
The basic design of the Tetrarch was used for a number of developments during the war years. One was the **Light Tank Mk VIII Harry Hopkins**, a number of which were produced but never used. The Harry Hopkins was virtually a Tetrarch with thicker armour (6-38 mm/0.25-1.5 in rather than 4-15 mm/0.15-0.6 in) and many mechanical changes, but it also acted as the basis for yet another variant known as the **Alecto**. This was to have been an airborne or light self-propelled gun mounting a 95-mm (actually 94-mm/3.7-in) howitzer, but few of these were produced. Despite plans to produce versions with 25-pdr or even 32-pdr guns, the only versions to be built were fitted with dozer blades for a possible airborne engineer role. In the event the Alectos ended up as hack tractors on Salisbury Plain.



Above: Carried in a Hamilcar glider, the Tetrarch was used by British airborne forces during the Normandy landings. Hopelessly outclassed by German tanks, this Tetrarch has a Littlejohn adapter fitted to its 2-pdr gun to increase muzzle velocity and thus armour penetration.

Specification

Tetrarch
Crew: 3
Weight: 7620 kg (16,800 lb)
Powerplant: one Meadows 12-cylinder petrol engine delivering 123 kW (165 bhp)
Dimensions: length overall 4.305 m (14 ft 1.5 in); length of hull 4.115 m (13 ft 6 in); width 2.31 m (7 ft 7 in); height 2.121 m (6 ft 11.5 in)
Performance: maximum road speed 64 km/h (40 mph); maximum cross-country speed 45 km/h (28 mph); fording 0.914 m (3 ft); trench 1.524 m (5 ft)



Right: Originally a Vickers private venture, the Tetrarch was put into production despite lacking armour, effective armament or a properly defined purpose. It eventually saw limited action in Madagascar and the USSR before being adopted as Britain's first air-portable tank.

British Cruiser Tanks

British designers concluded that tanks should be divided into two types: one to support the infantry in battering a hole in the enemy line, and another to pour through the gap in headlong pursuit. The first would be well armoured but slow, and second would sacrifice protection to gain speed. Unfortunately, this philosophy led to British armoured forces using decidedly inferior vehicles in a tragically amateurish fashion.

Cruisers were designed to perform the cavalry roles of reconnaissance and pursuit. These are Mk I A9s, the first Cruiser tanks; they were lightly protected and armed with the feeble 2-pdr. Many were left in France after Dunkirk. The survivors served in North Africa until 1941.

During the years immediately after World War I the British army gradually lost the lead in tank design and employment that it had gained during the years 1916-8. This resulted from all manner of reasons, one of them being lack of money for new designs or experiments and another the loss of trained and skilled men as the army's manpower resources were allowed to run down. But a small core of sturdy souls managed to keep some flicker of interest in the tank and its associated tactics and among these were some of the most influential and far-sighted tank philosophers of the day.

One of these men was Colonel J. F. C. Fuller and the other Captain B. Liddell Hart, although the latter was a retired officer. Both had experience of tank warfare during World War I and had the vision to see ahead to the time when the tank would dominate the battlefield in the way it did during the early years of World War II. But for all their foresight the main emphasis that these men provided was on 'all-armour' forces in which the tank predominated to give rise to rapid fluid campaigns with tactics based on speed and shock. During the 1920s some experimental formations were used to try out such tactics, but they did not last long before funds were used up and the experimental units disbanded.

But they left behind an influence that was to bedevil British tank design for years to come. One of the lessons 'learned' was that there had to be two types of tank for future warfare. One would be a slow well-armoured tank for the direct support of infantry units and the other a much faster vehicle with armour sacrificed for speed in order to exploit armoured breakthroughs and strike deep into an enemy's rear areas. This led directly to the division between 'Infantry' and 'Cruiser' tanks.

The 'Infantry' tanks evolved as slow vehicles protected by thick armour belts. The 'Cruisers' were relatively fast and had much thinner armour. What both lacked was proper armament, for in both instances the designers simply took what ordnance there was to hand and fitted it to their designs with little thought for future developments. For both the 'Infantry' and the 'Cruiser' tanks this meant the little 2-pdr gun which fired a high-velocity armour-piercing shot. This gun had a calibre of 40 mm (1.575 in), and during the 1930s it was as good an armour-piercing gun as any in service anywhere, but it had the limitation that it could not fire a high explosive shell and this led to the anomaly of some 'Cruisers' (and 'Infantry' tanks) having to mount a low-velocity 76.2-mm (3-in) howitzer firing shells for local close support; these were known as CS tanks.

While the 'Infantry/Cruiser' tank division had its attractions, it overlooked the fact that successful tank designs have a balanced division between firepower, protection and movement. If any one of these attributes is sacrificed or neglected for the sake of any other the imbalance will create an unsuccessful weapon. With the 'Cruisers' two of these attributes, firepower and protection, were sacrificed for speed in order to carry out the 'armoured breakthrough' and 'strike deep' philosophies of the interwar armoured philosophers. Other nations did not follow the British reasoning. For instance, the Germans directly followed Liddell Hart's and Fuller's philosophies closely but produced in their Panzers vehicles with a much better balanced combination of weaponry, protection and performance, with no differentiation between 'Infantry' and 'Cruisers' at all. The Soviets simply built good tanks in huge numbers while the Americans watched and waited until funding became available.

Coupled to the British philosophy was an understandable but regrettable lack of design expertise and production capability. Between the wars armament production centres were nearly all allowed to run down, to the extent that the heavy engineering facilities required for tank production were virtually nonexistent. Vickers was the only major concern to maintain tank production of any kind, and it kept going on commercial export orders for various designs of light and medium tanks for all parts of the world. Not surprisingly Vickers gained an experience in basic tank design and construction that had to be learned the hard way by many of the concerns that became involved in tank manufacture during the late 1930s, when the war clouds gathered once more over Europe.

These new concerns were gathered into the tank manufacture business as part of an official programme to build up a tank industry. The larger automobile and truck producers were obvious candidates for selection but included in the fold were workshops more used to producing shipping and steam locomotives. In time these concerns had to assume some form of design parentage as well as production, and subsequently some of them produced designs from scratch that with hindsight were less than successful.

But this is to work ahead of the 'Cruiser' story somewhat, for the first 'Cruiser' tanks were both produced by Vickers-Armstrongs. The first was the A9 Cruiser Tank Mk I, which used an AEC bus engine as a powerplant and was a simple design with lots of flat surfaces riveted together. It had the then-fashionable feature of

An A9 leads two Cruiser Mk IVs on exercise on 30 August 1940. The Mk IVs were archetypal cruiser tanks, thin-skinned and undergunned but capable of high speed. Their Christie suspension proved a great success.

twin auxiliary turrets mounted one on each side of the driver's position forward and each mounting a machine-gun. The suspension was of a 'slow motion' type that was to be used virtually unchanged on many future Vickers designs.

The A10 Cruiser Tank Mk II was also a Vickers-Armstrongs design, but it was originally designed as an 'Infantry' tank. In the event it became something of a hybrid and was termed a 'Heavy Cruiser'. It lacked the auxiliary turrets of the Mk I but was otherwise generally similar. But even as the Mks I and II were rolling off the lines of converted railway carriage workshops a new design was in the offing. This was the A13 Cruiser Tank Mk III, which featured the torsion-bar suspension devised by J. Walter Christie which offered improved cross-country performance and increases in speed. Up to the introduction of the Christie suspension most tank designs used what was generally known as the Horstmann suspension which was simple and easy to repair (or replace) when damaged but had only a limited travel which limited performance; the Christie suspension offered a much larger travel. It was adopted for the Mk III, which went into production under the parentage of the Nuffield Organization.

The Mk III followed the general layout and appearance of the two earlier marks, apart from the suspension which now featured large road wheels. The Cruiser Tank Mk IV was virtually an uparmoured version of the Mk III.

All of these 'Cruiser' marks formed the bulk of the British army's tank strength when World War II began in September 1939. Their numbers were bulked out by the Matilda Infantry Tanks Mk I and II, but these latter vehicles were issued as intended in battalions for the direct support of infantry formations and their slow speed rendered them unsuitable for the envisaged 'Cruiser' operations. When the BEF left for France the newly-formed 1st Armoured Division did not go with it, for it was still in a state of training and equipment familiarization, and was in all truth unready for war. All manner of stores were missing, weapons were in short supply and many tanks were in no state for combat. Reasons for the last were not hard to find: designed in most cases from scratch, the 'Cruisers' were not very reliable and a general lack of appreciation of the importance of maintenance rendered many vehicles unfit for combat.

The 1st Armoured Division arrived in France in early 1940, just in time for the German onslaught of May 1940. When it arrived the division was lacking all manner of items from main guns and machine-guns to spares and ammunition. The division lacked its field artillery, bridging equipment and many other units, including its anti-aircraft guns. Even the tanks were lacking in many items, some having to go into action with nothing more offensive than a crewman's rifle poking through the gun mantlet where a gun should have been. Many of the squadrons had to be issued with light tanks as 'Cruisers' were not available, and so the sorry story went on.

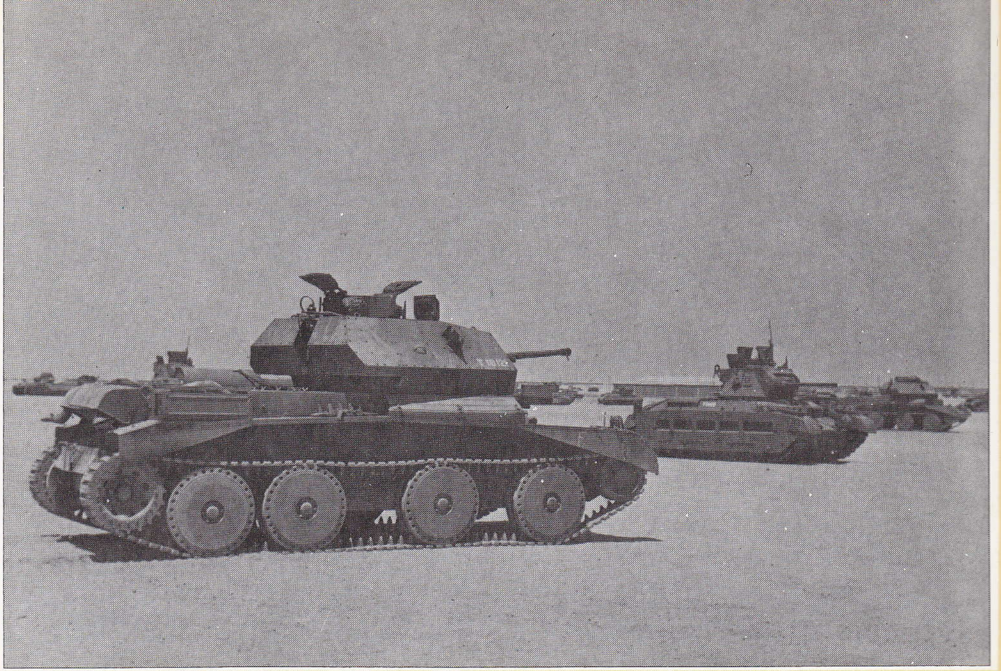
The blow that halted the German Panzers at Arras were 'Infantry' tanks, not 'Cruisers'. The 'Cruisers' were located mainly to the west of the main German thrust across northern France, and although they remained in action on and off for three to four weeks they were able to accomplish little and suffered heavy casualties in the process. Too late the unfortunate tank crews learned that the armour of their charges was too thin to defeat even the lightest of the German anti-tank guns, and that their 2-pdr guns were of little avail against the heavier Panzers. They also had to learn new tactics in the heat of battle, and too many tanks were lost when their crews simply charged at the enemy in time-honoured cavalry fashion. In place of the charge they had to learn the well-executed flanking actions, the careful ambushes and the stealthy movements that were much more effective.

While the 'Cruisers' in France were learning their trade, their counterparts in the Middle East were also learning, but with the added problems of tank survival and logistics in the desert. Cruisers of all marks took part in the early campaigns against the Italians in 1940 and 1941, when the hard lessons of France were often driven home regarding firepower and protection, for the Italians had some very effective anti-tank guns.

The expected replacement for the early 'Cruisers' was supposed to be the Covenanter, but this design was rushed into production in an attempt to boost tank totals with the inevitable result that it suffered from endless mechanical and other troubles. Although the Covenanter was used extensively for training it was never used in action, and thus the early 'Cruisers' were replaced by the A15 Cruiser Tank Mark VI, the Crusader. Like so many other rushed designs of the period the Crusader had more than its share of troubles, but it was gradually developed into a reliable vehicle, but one that still suffered the basic troubles common to all 'Cruisers', namely lack of armour and lack of a proper gun. In time the gun problem was partially overcome by the introduction of the more viable 6-pdr, but even this was inadequate when pitted against Panzers armed with much more powerful 75-mm (2.95-in) guns and fitted with better protection. But the Crusader was a nippy tank and was frequently able to use its performance to get it out of trouble. Lack of firepower usually meant that Crusaders came off worse against Panzers, however, and in the desert there were too many occasions when Crusaders were used to charge carefully-emplaced German defences with dreadful results.

Gradually the Crusaders were replaced in the desert campaigns by the M3 Lee/Grant and the M4 Sherman, which were much more reliable and better armed, and had at least a modicum of protection. But the 'Cruiser' line did not end there. Other designs such as the Cavalier, Centaur and Cromwell appeared but these bore little resemblance to the earlier 'Cruisers'. They were much better overall designs with better guns and armour, and although many carried over some of the mechanical troubles of the early days they were better combat tanks.

Perhaps the best indication of the drawbacks suffered by the early 'Cruisers' was the fact that during many of the early desert battles the Valentine infantry tank had to take the place of the 'Cruisers'. It was a much better tank for the purpose than the 'Cruisers', but this was mainly the result of the fact that it came from a Vickers background based on experience gained over the years of design and manufacture know-how. The early 'Cruisers' generally lacked this background and they and their crews suffered accordingly.

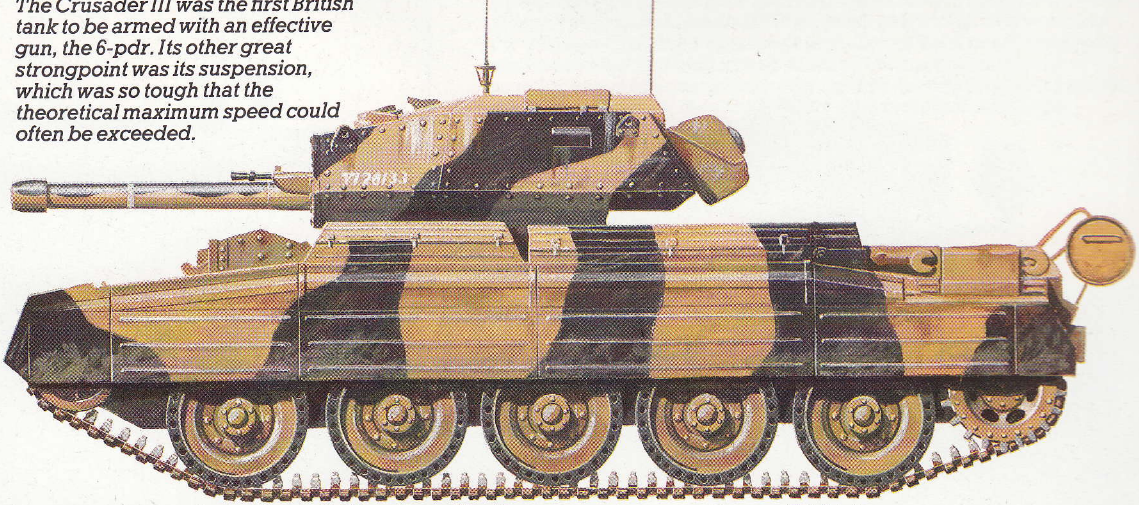


The two types of tank produced by pre-war theory: on the left, the fast but terribly vulnerable Mk IV Cruiser; on the right, the thickly armoured Matilda which could only make about 13 km/h (8 mph) cross-country.

Cruiser Mk IVs were armed with the 2-pdr gun, which had weak armour penetration and, worse, no high explosive round to tackle enemy anti-tank guns and strongpoints.

UK

Cruiser Tank Mk VI Crusader



The Crusader III was the first British tank to be armed with an effective gun, the 6-pdr. Its other great strongpoint was its suspension, which was so tough that the theoretical maximum speed could often be exceeded.

The **Cruiser Tank Mk VI** that became known as the **Crusader** had its origins around the same time as the Covenanter, but was a Nuffield design and therefore used the Nuffield Liberty Mk III engine and a Nuffield gearbox. In overall appearance and layout the Crusader resembled the Covenanter, but there were several differences. One was that the Crusader had five road wheels on each side instead of the Covenanter's four.

The prototype was known as the **A15**. It had the unusual feature of two forward miniature turrets, one in front of the driver's hood and the other for a gunner seated in the front hull. Each of these turrets was fitted with a 7.92-mm (0.312-in) machine-gun, but after early trials the driver's gun and turret was eliminated. These early trials once more highlighted that engine cooling was inadequate and that the gear-change arrangements were unreliable. These problems, and others, took a long time to remedy and, indeed, many were still present when the Crusader was withdrawn from service.

The first production model was the **Crusader I**, which had a 2-pdr (40-mm/1.58-in) gun and armour with a 40-mm (1.58-in) basis. When Crusader Is entered service in 1941 they were already inadequate for combat, and as the new 6-pdr (57-mm/2.24-in) gun was still in short supply the armour alone was increased in thickness to a 50-mm (1.97-in) basis to produce the **Crusader II**, and it was not until the **Crusader III** that the 6-pdr gun was fitted. This turned out to be the main 'combat' version of the Crusader during the North African campaigns before it was replaced by the American M4 Sherman. In action the Crusader proved fast and nippy, but its armour proved to be too thin, and the Crusaders armed with 2-pdr guns were no match for their German counterparts. Their reliability problems did little for Crusaders' chances of survival under desert conditions, but gradual improvements were effected. The **Crusader IICS** was fitted with a 76.2-mm (3-in) howitzer.

Once they were no longer combat tanks the Crusaders were used for a variety of special purposes. Some were converted as anti-aircraft tanks mounting either a single 40-mm (1.58-in) Bofors gun (**Crusader III AA I**) or twin or triple 20-mm (0.787-in) cannon (**Crusader III AA II**). There was a **Crusader ARV** armoured recovery vehicle version without a turret (but with an 'A' frame jib) and another turretless version featured a dozer blade for combat engineering purposes (**Crusader Dozer**). Many Crusaders were fitted with an open box superstructure for use as high-speed artillery tractors (**Crusader Gun Tractor**), and were widely used in Europe during 1944 and 1945 to tow 17-pdr (76.2-mm/3-in) anti-tank guns. Many more were used for trials that ranged from engine installations via mine warfare devices to wading trials that led to the 'Duplex Drive' tanks.

The Crusader was one of the 'classic' British tanks of World War II, and had a dashing and attractive appearance that belied its lack of combat efficiency. Despite its low and aggressive silhouette it was outclassed as a battle tank on many occasions, but saw the war out in several special-purpose variants.

Specification

Crusader III

Crew: 3

Weight: 20067 kg (44,240 lb)

Powerplant: one Nuffield Liberty Mk III petrol engine developing 254 kW (340 bhp)

Dimensions: length 5.994 m (19 ft 8 in); width 2.64 m (8 ft 8 in); height 2.235 m (7 ft 4 in)

Performance: maximum road speed 43.4 km/h (27 mph); maximum cross-country speed 24 km/h (15 mph); range with extra fuel tank 204 km (127 miles); fording 0.99 m (3 ft 3 in); vertical obstacle 0.686 m (2 ft 3 in); trench 2.59 m (8 ft 6 in)

Two early model Crusaders are seen during Operation 'Crusader'. The battle demonstrated that gallantry alone is not a substitute for good equipment.

UK

Cruiser Tank Mk VIII Cromwell

In the United Kingdom the differentiation between 'Cruiser' and 'Infantry' tanks persisted almost until the end of the war despite the fact that most other nations had never entertained the notion. It persisted even after the unfortunate experiences of the early 'Cruiser' designs had highlighted the drawbacks of producing a lightly armed and armoured main battle tank, and continued even when a replacement for the Crusader was being sought. The need for more armour and a bigger gun was finally realized (and a more powerful engine would be required) and in 1941 a new specification was issued. It was answered by two main entrants to the same basic **A27** design, one the A27L with a Liberty engine (this was to become the Centaur) and the other the **A27M** with a Rolls-Royce Meteor that was to become the **Cruiser Tank Mk VIII Cromwell**.

The first Cromwells were produced in January 1943. The first three marks (**Cromwell I** with one 6-pdr and two Besa machine-guns, **Cromwell II** with wider tracks and only one machine-gun, and **Cromwell III** produced by re-engining a Centaur I) all had as their main armament the 6-pdr (57-mm/2.244-in) gun, but by 1943 it had

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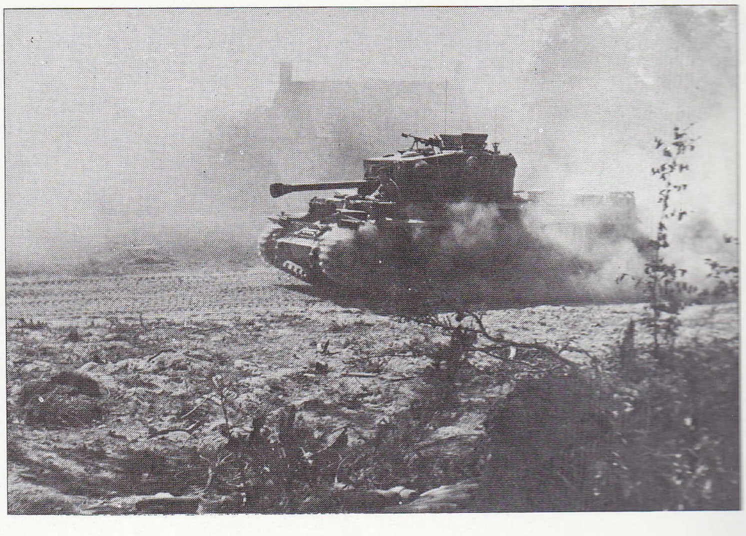
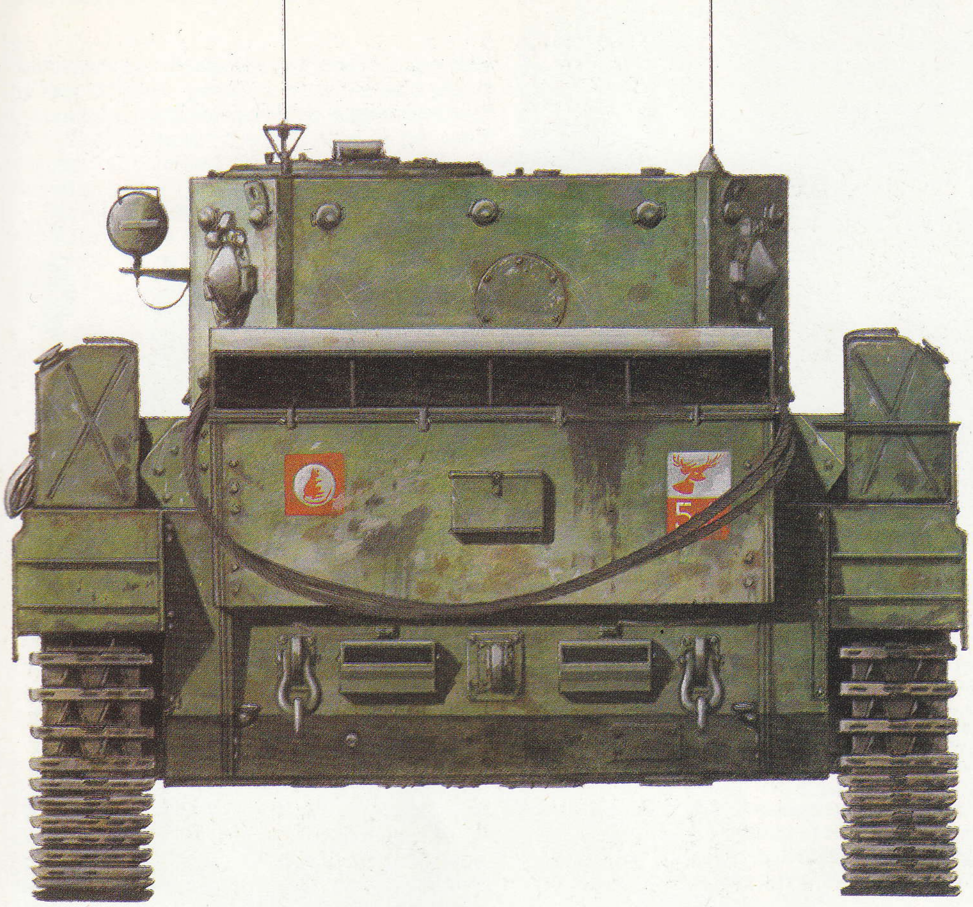


A Cromwell roars through a village in Normandy, August 1944. Initially mounting a 6-pdr, by D-Day they were armed with a 75-mm gun which gave them a reasonable chance against German armour. The Cromwell entered service in 1943 and many crews were trained in it before the invasion. In the acid test of combat, the Cromwell itself did not let them down.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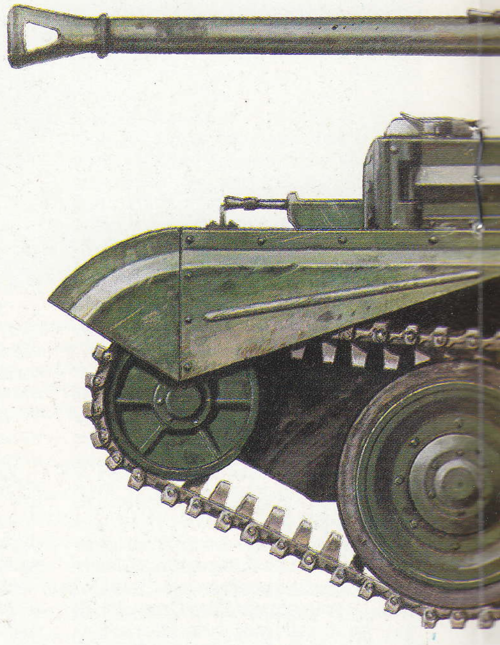

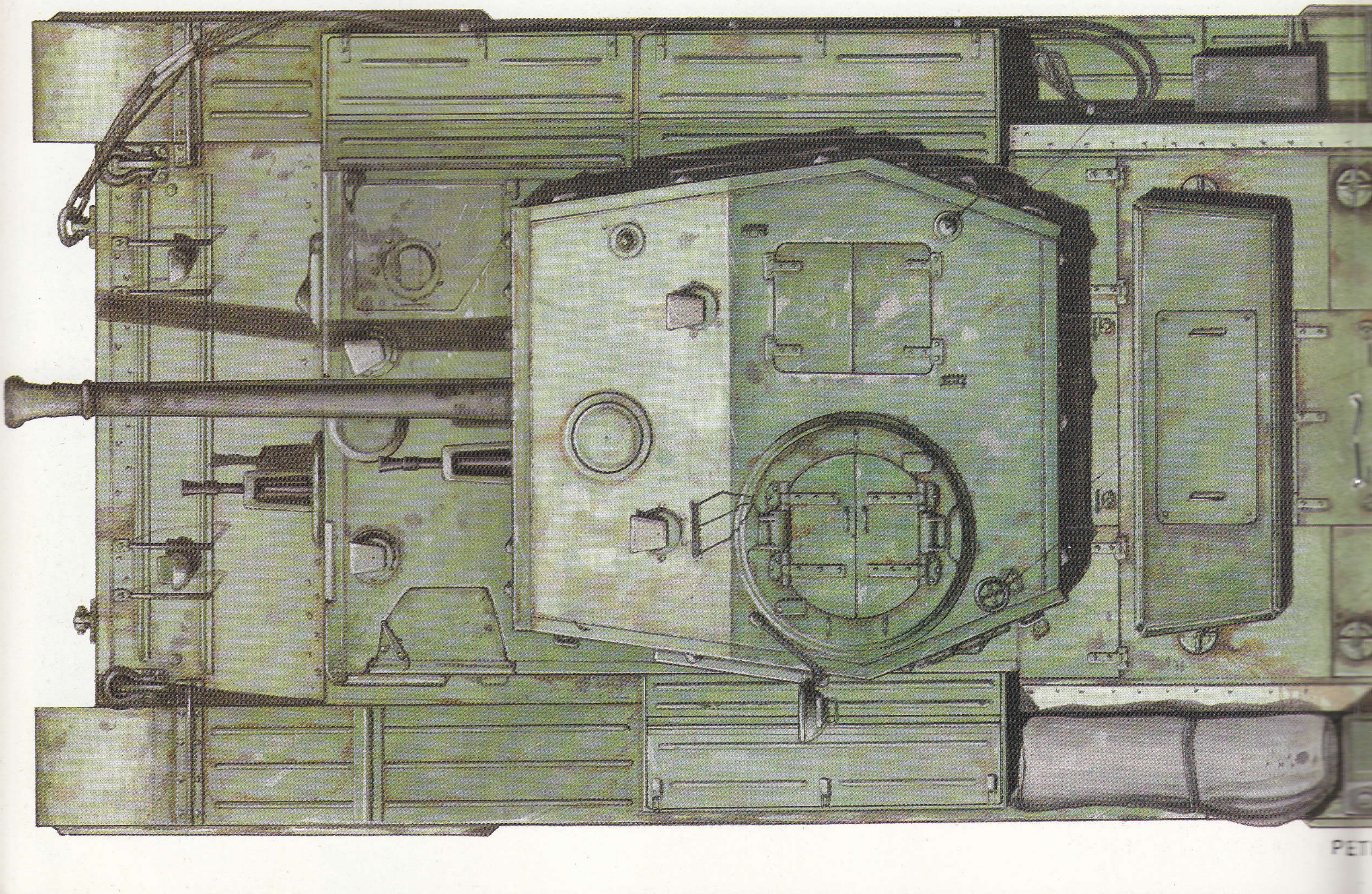
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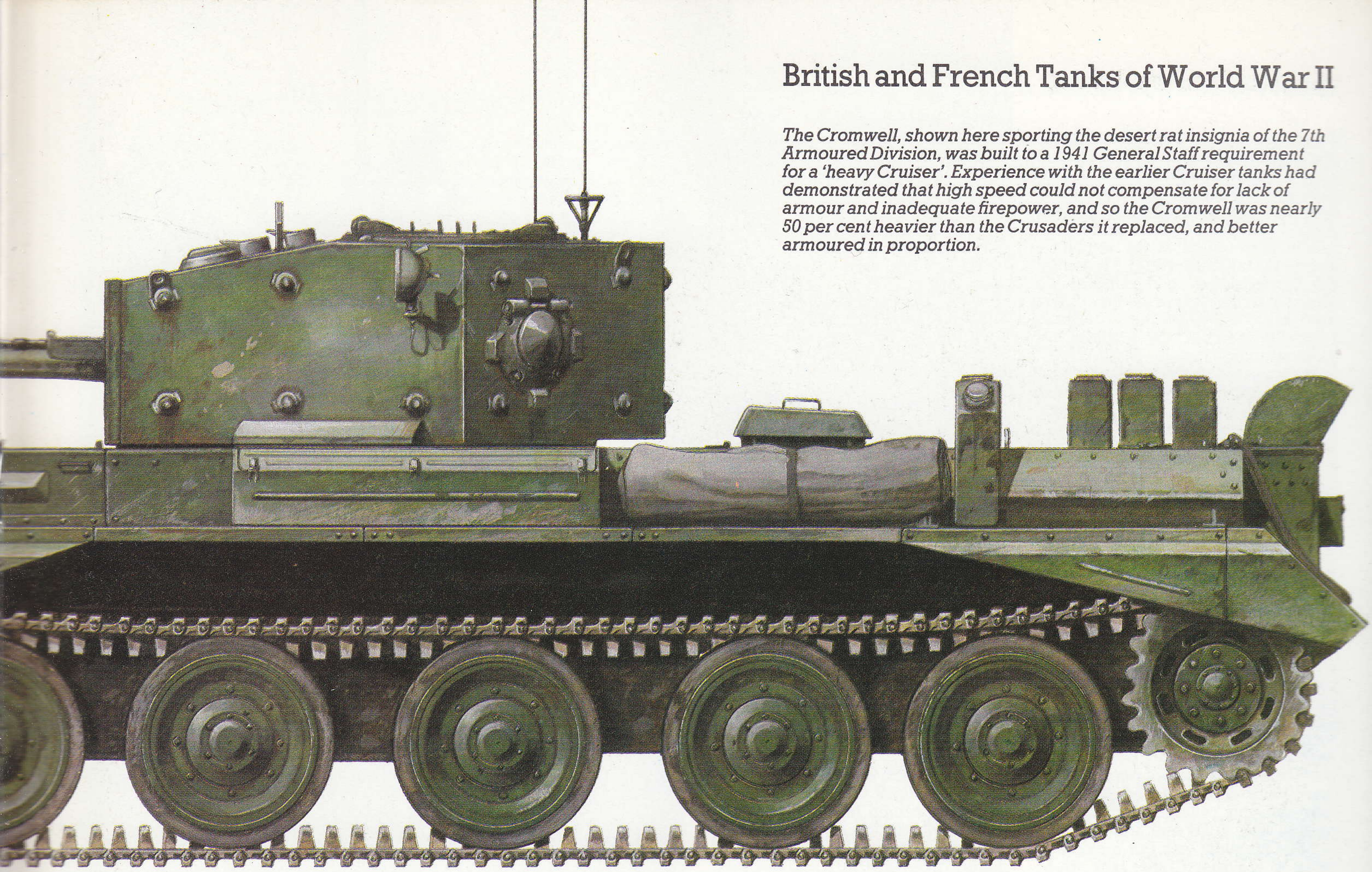
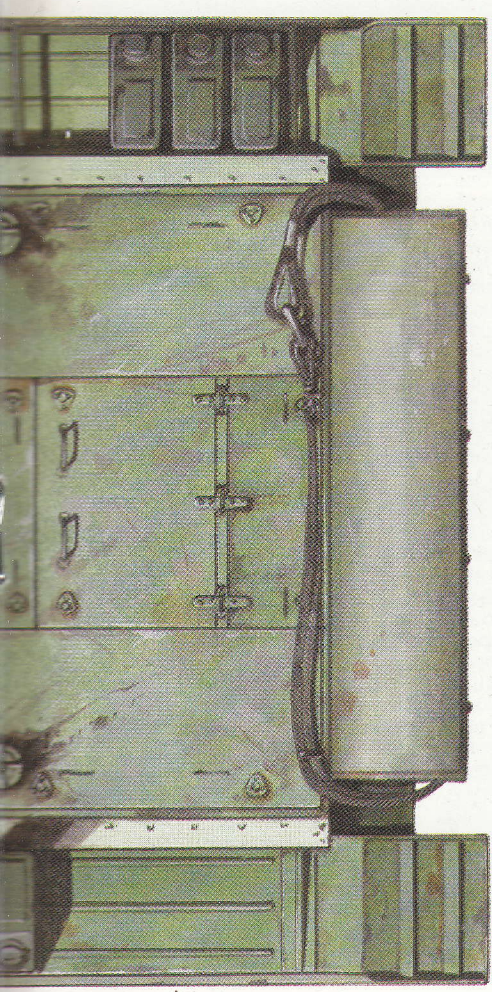
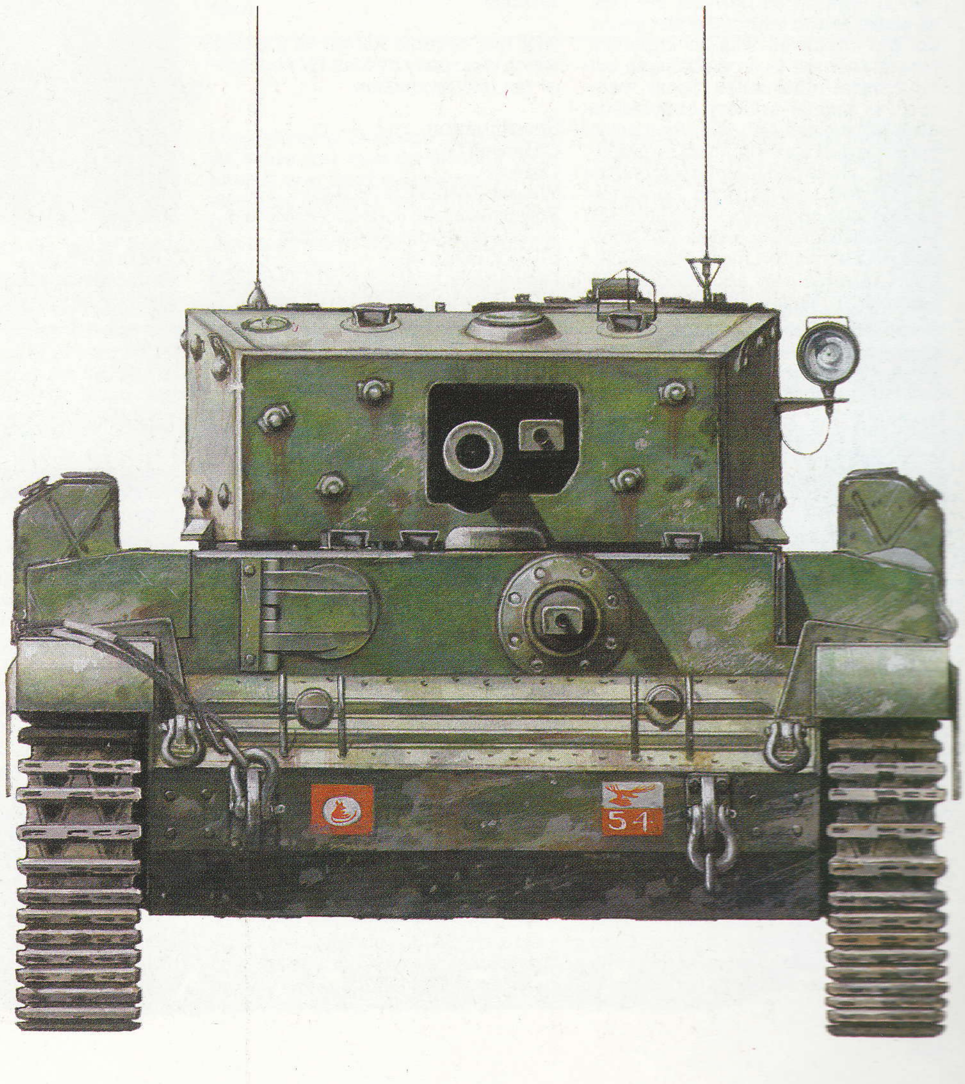
The Cromwell, shown here sporting the desert rat insignia of the 7th Armoured Division, was built to a 1941 General Staff requirement for a 'heavy Cruiser'. Experience with the earlier Cruiser tanks had demonstrated that high speed could not compensate for lack of armour and inadequate firepower, and so the Cromwell was nearly 50 per cent heavier than the Crusaders it replaced, and better armoured in proportion.







TER SARSON / TONY BRYAN

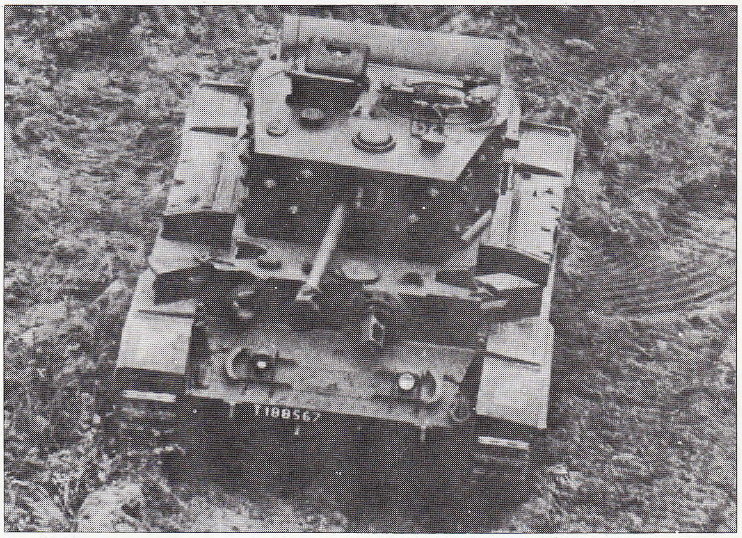
Cruiser Tank Mk VIII (continued)

been decided that something heavier would be required and a new 75-mm (2.95-in) gun was demanded. For once things were able to move relatively swiftly on the production lines and the first 75-mm (2.95-in) **Cromwell Mk IV** tanks were issued to the armoured regiments in October 1943. Thereafter the 75-mm (2.95-in) gun remained the Cromwell's main gun until the **Cromwell Mk VIII**, which had a 95-mm (actually 94-mm/3.7-in) howitzer for close support.

Perhaps the main value of the Cromwell to the British armoured regiments during 1943 was as a training tank, for at last the troops had a tank that was something of a match for its German counterparts. There was better armour (8-76 mm/0.315-3 in) on the Cromwell than on any previous 'Cruiser' tank and the 75-mm (2.95-in) gun, which shared many components with the smaller 6-pdr, at last provided the British tankies with a viable weapon. But by the time they were ready for active service the Cromwells were in the process of being replaced by the readily-available M4 Sherman for purposes of standardization and logistic safety. But the Cromwell did see service. Many were used by the 7th Armoured Division in the campaigns that followed from the Normandy landings. Here the excellent performance provided by the Meteor engine made the Cromwell a well-liked vehicle: it was fast and reliable, and the gun proved easy to lay and fire.

The Cromwell was but a stepping stone to the later Comet tank which was to emerge as perhaps the best all-round British tank of the war years. But the Cromwell was an important vehicle, not just as a combat tank but for several other roles. Some were used as mobile artillery observation posts (**Cromwell OP**) with their main gun removed and with extra radios installed. Others had their turrets entirely removed and replaced by all the various bits and pieces required for the Cromwell to be used as the **Cromwell ARV** armoured recovery vehicle. The Cromwell was also used as the basis for a heavily armoured assault tank that became known as the **A33**, which was ready by May 1944 but never got into production.

Above: Cromwell tanks move up to their start line for one of the breakout battles in Normandy, 1944. The price of attacking the well-sited German positions was often heavy, despite the improved quality of British armour.



Right: Although the majority of British tank units were equipped with the Sherman, the Cromwell was a successful design, doing much to restore the dreadful imbalance of quality between British and German armour.

Specification
Cromwell IV
Crew: 5
Weight: 27942 kg (61,600 lb)
Powerplant: one Rolls-Royce Meteor V-12 petrol engine developing 570 bhp (425 kW)
Dimensions: length overall 6.42 m (21 ft 0.75 in); width 3.048 m (10 ft); height 2.51 m (8 ft 3 in)
Performance: maximum speed 61 km/h (38 mph); road range 278 km (173 miles); fording 1.219 m (4 ft); vertical obstacle 0.914 m (3 ft); trench 2.286 m (7 ft 6 in)

UK

Cruiser Tank Mk VIII Centaur

The **Cruiser Tank Mk VIII Centaur** was a contemporary of the Cromwell and was derived from the same general staff specification. But whereas the Cromwell was a Rolls-Royce Meteor-engined vehicle, the Centaur was a Leyland Motors project and was fitted with the Liberty engine. In many other respects the Centaur and the Cromwell were identical (apart from the engines, gearboxes and other transmission components) and some Centaurs were fitted with the Meteor engine at a later stage and redesignated Cromwells.

Leyland had already produced a 'Cruiser' tank design known as the **Cruiser Tank Mk VII Cavalier** which had proved to be a generally unsuccessful design as a result of poor performance, mechanical breakdowns and a short engine life. Leyland understandably used some features of the Cavalier on the Centaur but unfortunately it also carried over some of the earlier design's problems, for the Liberty engine was really too low powered to provide the Centaur with the same performance as the Cromwell; nor was the engine life up to the standards of the Meteor's reliability.

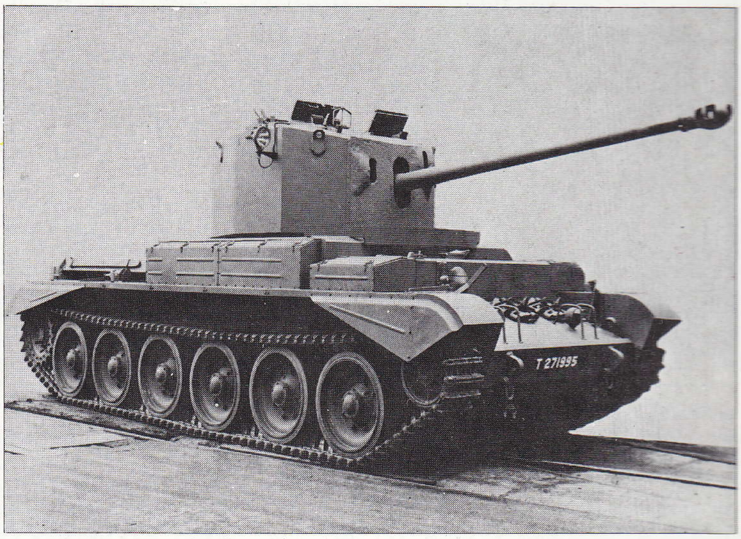
The **Centaur I** was produced with the usual 6-pdr (57-mm/2.244-in) gun of the period, and the first examples were ready in June 1942. These early Centaurs were used only for training purposes, some with auxiliary fuel tanks mounted at the rear. The **Centaur III** was produced in small numbers only, but this mounted a 75-mm (2.95-in) main gun. Armour varied in thickness from 20 to 76 mm (0.8 to 3 in). The **Centaur IV** was the main 'combat' version of the series as it was specially produced for use by the Royal Marines Armoured Support Group during the D-Day landings in Normandy on 6 June 1944. These Mk IVs were fitted with 95-mm (actually 94-mm/3.7-in) close-support howitzers; 80 of them were issued, and these were intended to be used only in the initial stages of the amphibious assault. In fact most of them landed safely and performed so well on the beaches and the area immediately inland that many were retained for some weeks afterwards for the slow and dangerous combat in the *bocage* country.

Thereafter the Centaurs were withdrawn from combat use and underwent the usual routine of conversion for other purposes. As usual the simplest conversion was to an artillery observation post (**Centaur OP**) while others simply had their turrets removed to act as **Centaur Kangaroo** armoured personnel carriers. The usual armoured recovery vehicle variant duly appeared as the **Centaur ARV** along with the **Centaur Dozer** turretless version fitted with a dozer blade for combat engineer duties. Two Centaur conversions that did mount guns were the two marks of **Centaur III/IV AAI** and **Centaur III/IV AAII** tanks. These had the same 20-mm anti-aircraft turrets as the earlier Crusader AA tanks, but the Centaur AA versions mounted 20-mm (0.787-in) Polsten cannon in place of the earlier Oerlikon cannon. Both of these variants took part in the early stages of the Normandy campaign but were withdrawn once the anticipated threat of air attack did not materialize.

Specification
Centaur III
Crew: 5
Weight: 28849 kg (63,600 lb)
Powerplant: one Nuffield Liberty Mk V V-12 petrol engine developing 295 kW (395 bhp)
Dimensions: length 6.35 m (20 ft 10 in); width 2.895 m (9 ft 6 in); height 2.489 m (8 ft 2 in)
Performance: maximum road speed 43.4 km/h (27 mph); maximum cross-country speed about 25.7 km/h (16 mph); range 265 km (165 miles); fording 0.914 m (3 ft); vertical obstacle 0.914 m (3 ft); trench 2.286 m (7 ft 6 in)

UK

Cruiser Tank Challenger



Arguably the ugliest tank design of the period, the Challenger was a stretched Cromwell armed with a 17-pdr, armour being reduced to keep weight down. Fortunately for British tank crews the Sherman Firefly was adopted instead.

The **Cruiser Tank Challenger** produced during World War II bore no resemblance to the mighty Challenger that is currently being issued to the British army, for the original Challenger was one of the British tank industry's least successful progeny. It was derived from a 1941 request to mount a heavy gun capable of tackling even the heaviest German tanks and the 17-pdr (76.2-mm/3-in) gun, then completing its development, was selected as a likely weapon. The A27 Cromwell/Centaur chassis seemed a suitable basic chassis and work began on adapting this for the heavy gun project.

The new gun would require two things. One was a much larger chassis to accommodate the weights involved and the other a larger turret ring to absorb the recoil forces. At that time all existing designs were too narrow to accommodate so large a turret ring, but by lengthening the existing Cromwell chassis and adding another road wheel the turret ring section could be widened to enable a larger ring to be installed. This formed the basis of what became known as the **A30**, and eventually the name Challenger was bestowed upon the vehicle.

The first pilot model was ready in March 1942 and like many hasty improvisations it showed up badly during its early trials. The extra weight of the rather high and awkward turret was not balanced by the lengthened suspension, which proved to be a source of many troubles, and the mounting of the heavy gun in the turret made traverse so slow that the original traverse mechanism had to be redesigned and replaced. The large size of the 17-pdr fixed ammunition meant that only a restricted number of rounds could be carried internally, and the hull machine-gun had to be removed to make more room, leaving only the co-axial 7.62-mm (0.3-in) gun. Perhaps the biggest problem was that the weight overall was such that the armour protection had to be reduced to bring weight down to a reasonable level. Armour varied from 20 to 102 mm (0.8 to 4 in) in thickness. Despite all these problems the Challenger was ordered into production purely on the strength of its powerful gun, which was at least something that could destroy any known German tank.

But the Challenger was slow to get into production for a variety of reasons. It was not until March 1944 that the first production examples were ready and by then it was too late for the Challenger to take part in the extensive waterproofing programme that would be required for the Normandy landings. Another blow to the Challenger programme was the fact that the M4 Sherman had been adapted to take the 17-pdr, and as the Firefly this conversion assumed many of the responsibilities intended for the Challenger during the early stages of the post-Normandy campaign. Thus the Challenger languished while the Firefly fought its way across Europe.

But some Challengers did see service from late 1944 onwards. Numbers were issued to the reconnaissance regiments of the British armoured divisions to provide some extra fire support to the 75-mm (2.95-in) Cromwells which were by then the main equipment of these units. As soon as the war ended most Challengers were withdrawn. Some were sold overseas but the type rapidly vanished from the scene. The **Challenger II**, with a lower turret, was produced only in prototype form.

Specification
Challenger
Crew: 5
Weight: 33022 kg (72,800 lb)
Powerplant: one Rolls-Royce Meteor V-12 petrol engine developing 447 kW (600 bhp)
Dimensions: length overall 8.147 m (26 ft 8.75 in); width 2.90 m (9 ft 6.5 in); height 2.775 m (9 ft 1.25 in)
Performance: maximum speed 51.5 km/h (32 mph); range 193 km (120 miles); fording 1.37 m (4 ft 6 in) after preparation; vertical obstacle 0.914 m (3 ft); trench 2.59 m (8 ft 6 in)

UK

Infantry Tank Mks I and II Matilda

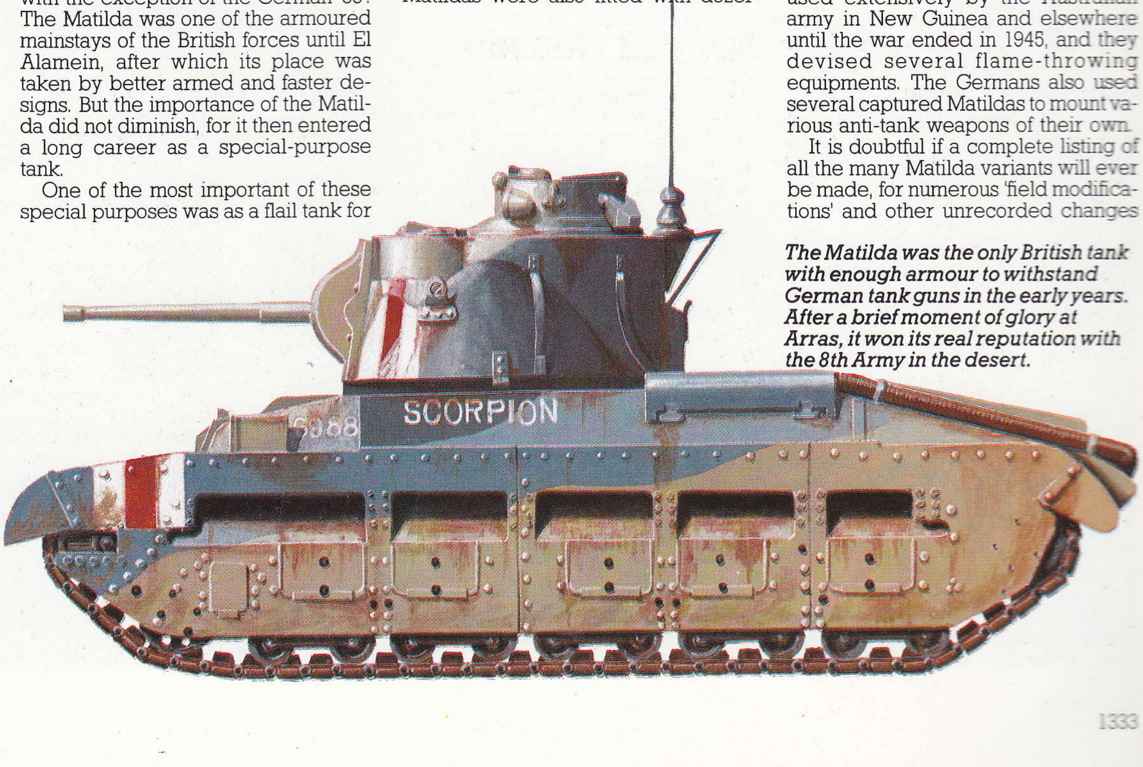
A requirement for a British army 'Infantry' tank was first made in 1934 and the immediate result was the **All Infantry Tank Mk I**, later nicknamed **Matilda I**. This was a very simple and small tank with a two-man crew but with armour heavy enough to defeat any contemporary anti-tank gun. The small turret mounted a single 7.7-mm (0.303-in) Vickers machine-gun and the engine was a commercial Ford V-8 unit. Orders for 140 were issued in April 1937, but when the type was tried in combat in France in 1940 it revealed many shortcomings: it was too slow and underarmed for any form of armoured warfare, and the small numbers that remained in service after Dunkirk were used only for training.

The Matilda I was intended only as an interim type before the **A12 Infantry Tank Mk II** became available. This project began in 1936 and the first examples were completed in 1938. The Mk II, known later as Matilda II, was a much larger vehicle than the Matilda I with a four-man crew and a turret mounting a 2-pdr (40-mm/1.575-in) gun and liberal belts of cast armour (varying from 20 to 78 mm/0.8 to 3.1 in in thickness) capable of defeating all known anti-tank guns. The Matilda II was slow as it was intended for the direct support of infantry units, in which role speed was not essential. Overall it was a good-looking tank and it turned out to be far more reliable than many of its contemporaries. And despite the light gun carried it was found to be a good vehicle in combat. The **Matilda IIA** had a 7.92-mm (0.312-in) Besa machine-gun instead of the Vickers gun.

The main combat period for the Matilda (the term Matilda II was dropped when the little Matilda I was withdrawn in 1940) was the early North African campaign, where the type's armour proved to be effective against any Italian or German anti-tank gun with the exception of the German '88'. The Matilda was one of the armoured mainstays of the British forces until El Alamein, after which its place was taken by better armed and faster designs. But the importance of the Matilda did not diminish, for it then entered a long career as a special-purpose tank.

One of the most important of these special purposes was as a flail tank for mine-clearing. Starting with the **Matilda Baron** and then the **Matilda Scorpion**, it was used extensively for this role, but Matildas were also used to push AMRA mine-clearing rollers. Another variant was the **Matilda CDL** (Canal Defence Light), which used a special turret with a powerful light source to create 'artificial moonlight'. Matildas were also fitted with dozer blades as the **Matilda Dozer** for combat engineering, and many were fitted with various flame-throwing devices as the **Matilda Frog**. There were many other special and demolition devices used with the Matilda, not all of them under British auspices for the Matilda became an important Australian tank as well. In fact Matilda gun tanks were used extensively by the Australian army in New Guinea and elsewhere until the war ended in 1945, and they devised several flame-throwing equipments. The Germans also used several captured Matildas to mount various anti-tank weapons of their own.

It is doubtful if a complete listing of all the many Matilda variants will ever be made, for numerous 'field modifications' and other unrecorded changes



The Matilda was the only British tank with enough armour to withstand German tank guns in the early years. After a brief moment of glory at Arras, it won its real reputation with the 8th Army in the desert.

were made to the basic design. But the Matilda accommodated them all and many old soldiers still look back on this tank with affection for, despite its slow speed and light armament, it was reliable and steady, and above all it had good armour.

Specification

Matilda II
Crew: 4
Weight: 26926 kg (59,360 lb)
Powerplant: two Leyland 6-cylinder petrol engines each developing 71 kW (95 bhp) or two AEC diesels each developing 65 kW (87 bhp)
Dimensions: length 5.613 m (18 ft 5 in); width 2.59 m (8 ft 6 in); height 2.51 m (8 ft 3 in)
Performance: maximum speed 24 km/h (15 mph); maximum cross-country speed 12.9 km/h (8 mph); road range 257 km (160 miles); vertical obstacle 0.609 m (2 ft); fording 0.914 m (3 ft); trench 2.133 m (7 ft)

A Matilda is seen in the desert in June 1941 during Operation 'Battleaxe', an unsuccessful attempt to relieve Tobruk which cost the 4th Armoured Brigade 64 of their Matildas. Tough but slow, the Matildas were cursed with the ineffectual 2-pdr as main armament.

UK

Infantry Tank Mk III Valentine

In 1938 Vickers was invited to join in the production programme for the new Matilda II tank, but as the company already had a production line established to produce a heavy 'Cruiser' tank known as the A10, it was invited to produce a new infantry tank based upon the A10. Vickers duly made its plans and its A10-derived infantry tank was ordered into production in July 1939. Up to that date the army planners had some doubts as to the effectiveness of the Vickers submissions, resulting mainly in the retention of a small two-man turret which would limit possible armament increases, but by mid-1939 war was imminent and tanks were urgently required.

The new Vickers tank, soon known as the **Infantry Tank Mk III Valentine**, drew heavily on experience gained with the A10, but was much more heavily armoured 8-65 mm (0.3-2.55 in). As many of the A10's troubles had already been experienced their solutions were built into the Valentine, which proved to be a relatively trouble-free vehicle. Mass production began rapidly, and the first **Valentine I** examples were ready in late 1940. By 1941 the Valentine was an established type, and many were used as Cruiser tanks to overcome deficiencies.

The Valentine was undoubtedly one of the most important British tanks, but the main reason for this was quantity rather than quality. By early 1944, when production ceased, 8,275 had been made and during one period in 1943 one quarter of all British tank production was of Valentines. Valentines were also produced in Canada and by several other concerns in the United Kingdom apart from Vickers.

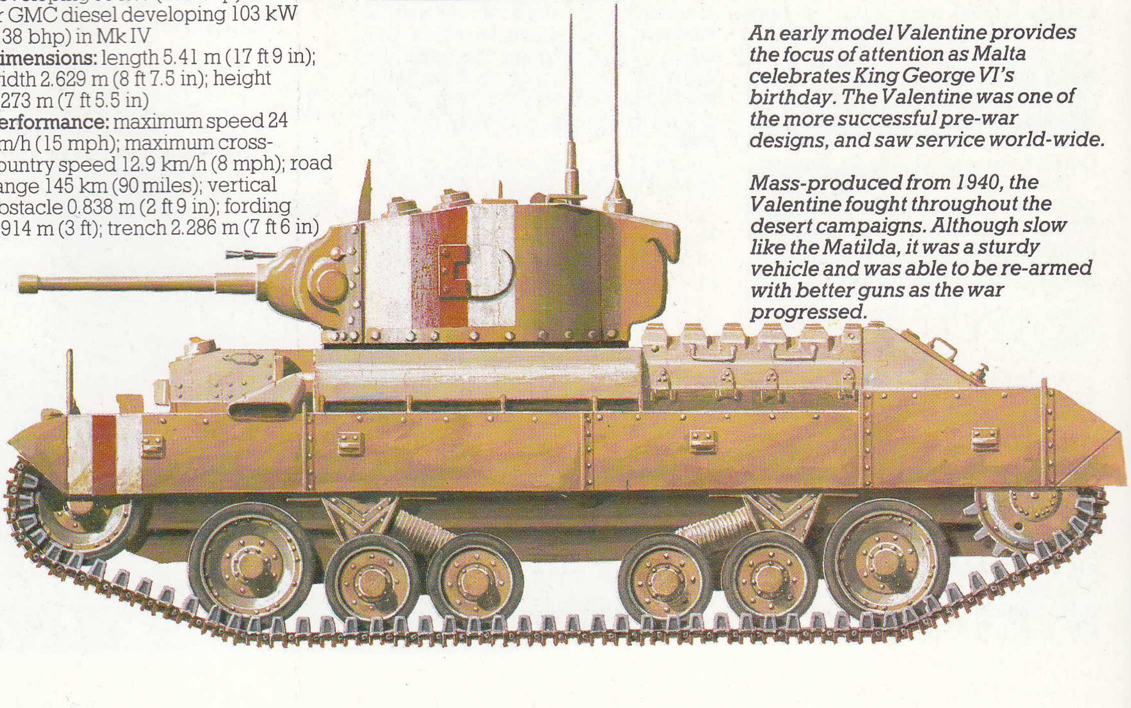
There were numerous variants on the Valentine. Gun tanks ran to 11 different marks with the main armament increasing from a 2-pdr (**Valentine I-VII**) via the 6-pdr (**Valentine VIII-X**) to a 75-mm (2.95-in) gun (**Valentine XI**), and there was even a self-propelled gun version mounting a 25-pdr field gun and known as the **Bishop**. Special-purpose Valentines ran the whole gamut from mobile bridges (**Valentine Bridgelayer**) to Canal Defence Lights (**Valentine CDL**) and from observation posts (**Valentine OP**) to mine-clearing devices (**Valentine Scorpion** and **Valentine AMRA**). The numbers of these variants were legion, many of them being one-off devices produced for trials or experimental purposes, typical of which were the early **Duplex Drive Valentine** vehicles used to test the DD system. Actually these tanks were so successful that the Valentine was at one time the standard DD tank. There were also **Valentine Flamethrower** tanks, and one attempt was made to produce a special tank-killer with a 6-pdr anti-tank gun behind a shield. That project came to nothing but the Valentine chassis was later used as the basis for the **Archer**, an open-topped vehicle with a 17-pdr gun pointing to the rear. This was used in Europe from 1944 onwards.

The basic Valentine tank was extensively modified throughout its operational career, but it remained throughout reliable and sturdy. The Valentine was one of the British army's most important tanks at one point. It was used by many Allied armies such as that of New Zealand, and many saw action in Burma. The bulk of the Canadian output was sent to the Soviet Union, where the type appears to have given good service. The Valentine did have its drawbacks, but overall its main contribution was that it was available in quantity at a time when it was most needed, and not many British tank designs could claim the same.

Specification

Valentine III/IV
Crew: 3
Weight: 17690 kg (39,000 lb)
Powerplant: one AEC diesel developing 98 kW (131 bhp) in Mk III or GMC diesel developing 103 kW (138 bhp) in Mk IV
Dimensions: length 5.41 m (17 ft 9 in); width 2.629 m (8 ft 7.5 in); height 2.273 m (7 ft 5.5 in)
Performance: maximum speed 24 km/h (15 mph); maximum cross-country speed 12.9 km/h (8 mph); road range 145 km (90 miles); vertical obstacle 0.838 m (2 ft 9 in); fording 0.914 m (3 ft); trench 2.286 m (7 ft 6 in)

An early model Valentine provides the focus of attention as Malta celebrates King George VI's birthday. The Valentine was one of the more successful pre-war designs, and saw service world-wide.



Mass-produced from 1940, the Valentine fought throughout the desert campaigns. Although slow like the Matilda, it was a sturdy vehicle and was able to be re-armed with better guns as the war progressed.

Operation 'Crusader'

After winning crushing victories over an Italian army many times its size, the British Army in North Africa was pushed back to Egypt by the newly-formed Afrika Korps led by Erwin Rommel. Only the port of Tobruk held out, and early British attempts to relieve it met with failure. British and Commonwealth forces under General Auchinleck paused until autumn, gathering strength. On 18 November 1941 over 700 British tanks struck out at the German line.

British tank crew perch on a Mk IV Cruiser to plan their attack. Auchinleck's aim was to relieve Tobruk and push the Germans back from Egypt; the task of British armour was to bring Rommel's tanks to battle and destroy them.

Operation 'Crusader' took place in the North African desert from 18 November to an indeterminate date in December 1941. It was a confused and muddled battle that involved one of the very first uses of British armour on a large scale against what was to be the British army's *bête noire*, Rommel and his Afrika Korps.

The sudden and unexpected arrival of the Afrika Korps in North Africa in early 1941 had created a great deal of trouble for the Allied forces following their early victories over the Italians during 1940. In practical terms the Allies had been pushed back across the Egyptian frontier from Libya leaving a garrison beleaguered in the port of Tobruk. The relief of these troops was an obvious objective for the Allied commander, General Sir Claude Auchinleck, who used much of the summer of 1941 planning a major counteroffensive. He was aware that a successful counteroffensive would require large amounts of matériel, including tanks, and much of the available time was spent in building up tank totals to an acceptable level. In fact they accumulated 756 tanks, of which 336 were 'Cruiser' vehicles (mainly of the early marks but with a sizable proportion of the new Crusaders), 225 'Infantry' tanks (mainly Matildas) and 195 light tanks. The last were American Stuarts, newly arrived in the Middle East and a vast improvement over the Vickers Light Tanks which they replaced. Unfortunately the Stuarts, for all their many good attributes, were not 'tropicalized' and lacked British wireless sets, so as soon as they arrived they had to move straight into the workshops for a modification programme which delayed the planned offensive.

Against this array of vehicles Rommel had 320 tanks, only 35 of which were 75-mm (2.95-in) armed PzKpfw IVs. He had also 139 PzKpfw IIIs and 146 Italian M.13s of various types. But this numerical deficiency masked one thing and that was that the Germans had an array of highly effective anti-tank guns (including the famous '88') and also had a well-established set of tactics for defensive co-operation between tanks, artillery and anti-tank guns. The British generally lacked this highly developed form of inter-arm co-operation and one of the main Allied arms, the artillery, was in a state of considerable disarray following a major reorganization conjured up in the middle of a campaign. The artillery often found itself fragmented and lacking any system to produce the massed fire effects that were essential to effective anti-tank defences.

The Allied counteroffensive was named Operation 'Crusader', and one of its main objectives was the relief of the 70th Division in Tobruk, while the overall priority was the destruction of the enemy armoured forces. Its main striking component was to be the 8th Army with its XXX Corps and XIII Corps. Combined with these two powerful corps would be the Tobruk garrison which was to play a major part in its own break-out. The plan of Operation 'Crusader' was basically simple. XIII Corps would initially hold the coastal road and the approaches to the important logistic areas to the rear. XXX Corps would make the usual sweep south and then north towards Tobruk and at the appropriate time the Tobruk garrison would strike outwards and hopefully catch the enemy in the rear.

The operation duly commenced on 18 November 1941 with the XXX Corps move. XXX Corps was mainly an armoured formation containing the 7th Armoured Division, the 4th

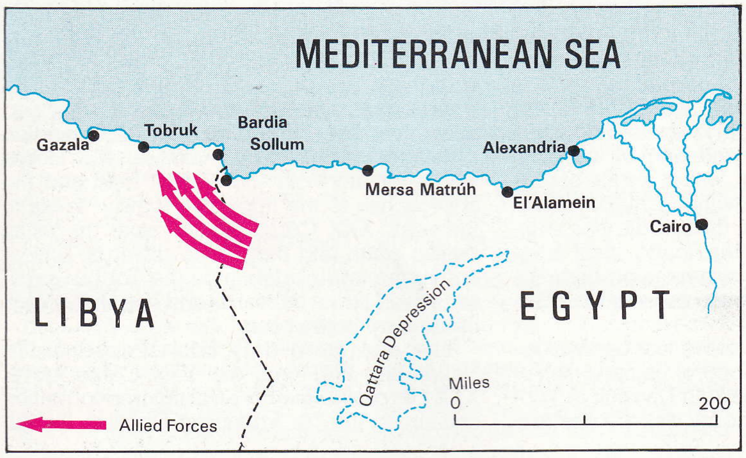
A formation of Mk IV Cruisers kicks up the dust as it speeds across the stony desert. Christie suspension enabled the Cruisers to travel at very high speeds over such ground, but the wear and tear on men and machines was severe.

Armoured Brigade Group, the 22nd Guards (Motor) Brigade and the 1st South African Division with the 2nd South African Division in reserve. This force moved around the border wire that divided Egypt from Libya, swept through all the old deserted Italian camp areas that had been taken so easily in the previous year, and then turned north towards Tobruk.

The main dominating feature on the approaches to Tobruk is the Sidi Rezegh ridge, about 19 km (12 miles) south of the Tobruk perimeter and the site of an important airstrip. This ridge was to become one of the most important features of the subsequent operations, and in the days and weeks that followed it was to be taken, lost and re-taken by both sides. But in the initial stages of XXX Corps' movements the overall cohesion of the advance began to break up. The leading elements, instead of remaining in a tight force, gradually fanned out across the desert areas making the enemy interception and dispersal of the various columns a relatively easy proposition. Time and again the advancing columns were met by what were frequently small German or Italian forces that were able to delay, harass and disrupt. Communications between the various Allied units was made virtually impossible by poor radio communications brought about by unsuitable equipment and a low overall standard of signals training. Thus instead of a carefully co-ordinated advance, XXX Corps' forces gradually moved towards Sidi Rezegh in a series of dispersed moves.

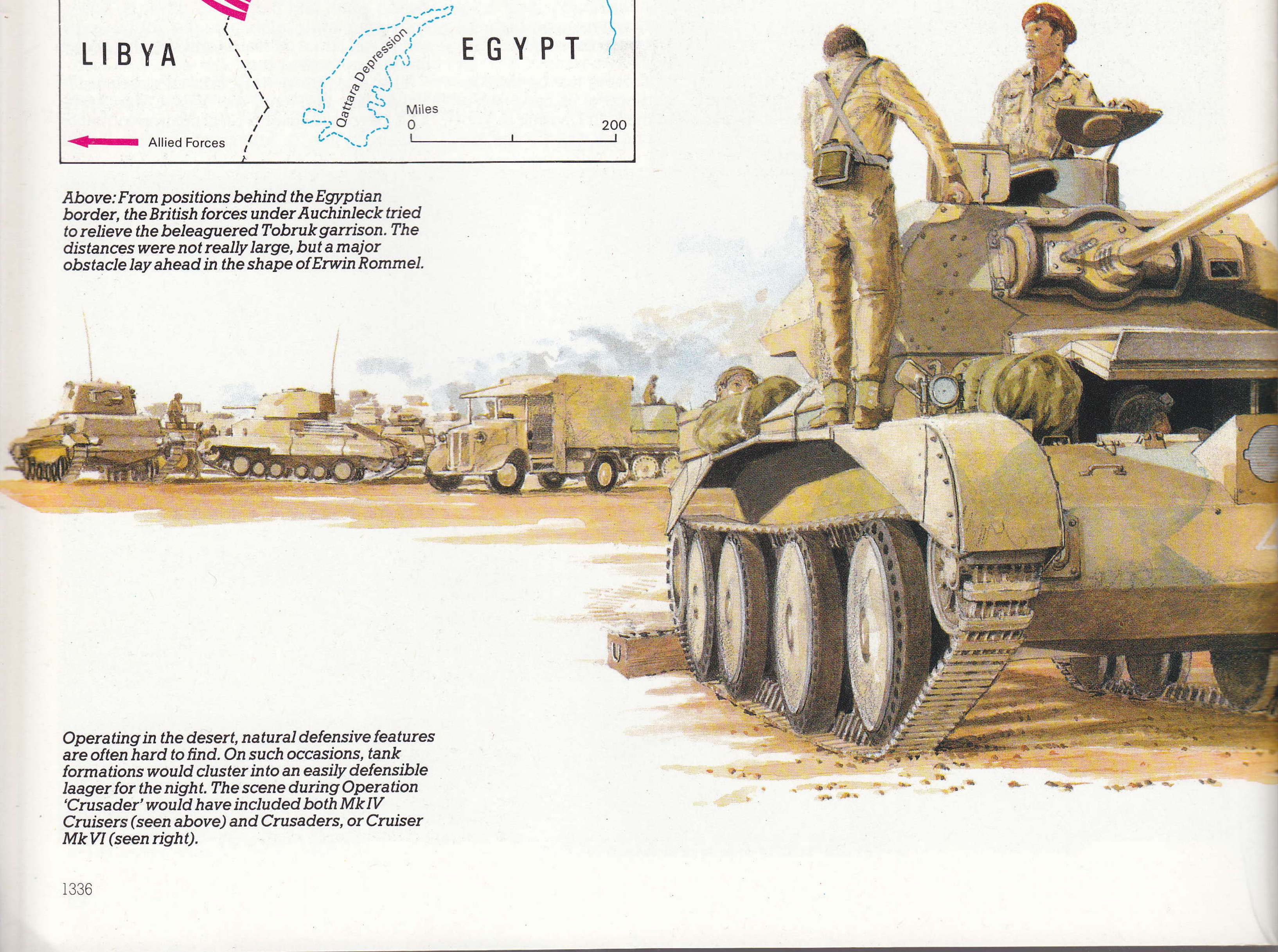
Once they arrived close to the Sidi Rezegh ridge some degree of concentration became possible, but while the Allies prepared a set-piece attack the Germans attacked them first. The set-piece attack degenerated into a series of hurried defensive actions into which isolated groups of tanks were fed piecemeal into the fray. On some occasions artillery support saved the day but in others isolated guns were left to provide what fire support they could. The occasion was saved for the British by the arrival on the scene of an armoured brigade when one of the involved brigades had only 28 tanks of any kind left. An attempt by the Tobruk garrison to become involved led to the loss of 60 tanks out of the 109 they had available.

But the Germans lost heavily too and withdrew, leaving Sidi Rezegh in Allied hands, at least for the moment. For a while all was quiet until the Germans attacked in divisional force and by accident captured the entire headquarters of an armoured brigade. This loss made the fighting even more confused, and Sidi Rezegh changed hands again. In this situation the battle-readiness and flexible tactics of the Germans showed to their advantage time and time again, while the Allies often attempted to remedy any local difficulty by charging at the enemy. This had its effect but all too often Allied casualties were heavy. But by 23 November XXX Corps had managed to concentrate its armour again.

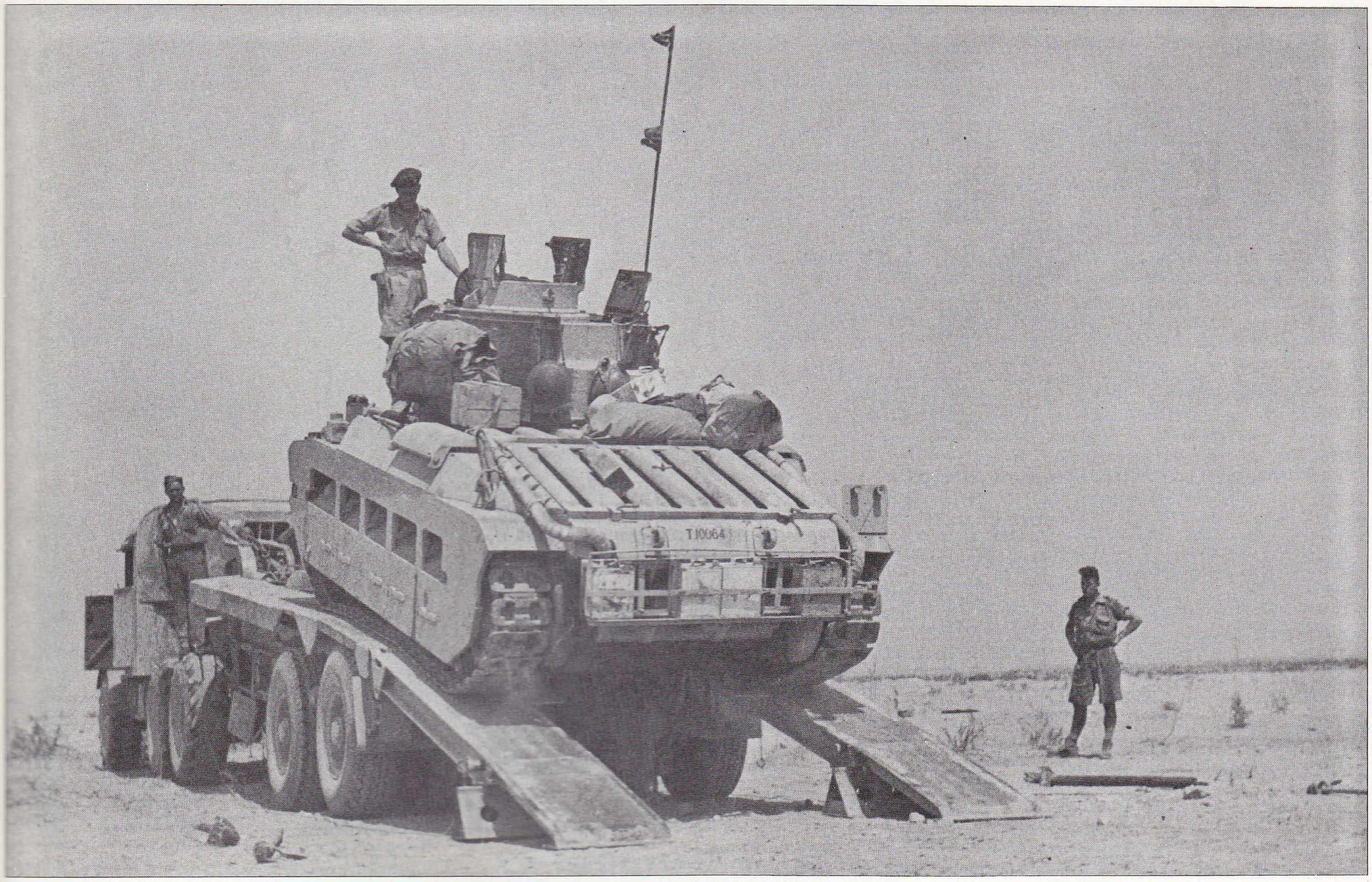


Above: From positions behind the Egyptian border, the British forces under Auchinleck tried to relieve the beleaguered Tobruk garrison. The distances were not really large, but a major obstacle lay ahead in the shape of Erwin Rommel.

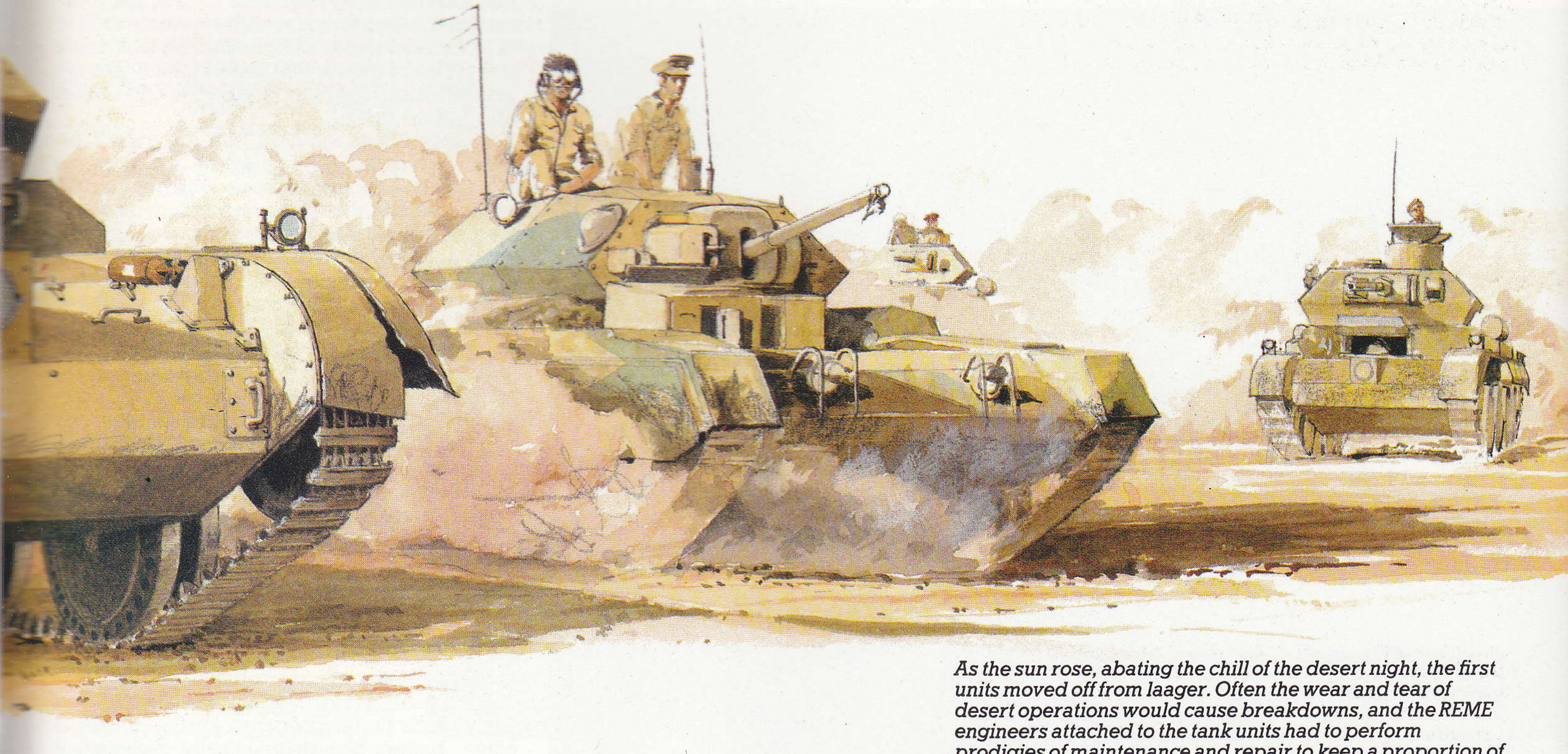
Fighting in the desert has never been particularly easy, with extremes of heat and cold, aridity and the ever-present dust. Bringing vehicles into such an environment multiplies the difficulties, as desert grit can find a way into the most carefully protected engine. Maintenance thus becomes of prime importance.



Operating in the desert, natural defensive features are often hard to find. On such occasions, tank formations would cluster into an easily defensible laager for the night. The scene during Operation 'Crusader' would have included both Mk IV Cruisers (seen above) and Crusaders, or Cruiser Mk VI (seen right).



Above: Matildas provided the bulk of the 225 infantry tanks which fought in the 'Crusader' battles. In such open terrain the slow-moving Matildas were vulnerable to longer-ranged German anti-tank guns.



As the sun rose, abating the chill of the desert night, the first units moved off from laager. Often the wear and tear of desert operations would cause breakdowns, and the REME engineers attached to the tank units had to perform prodigies of maintenance and repair to keep a proportion of the temperamental Crusaders on the move.

Operation 'Crusader'

Early on 23 November the Allies succeeded in capturing the headquarters of the Afrika Korps but the commander, General Cruewell, was absent and responded to the situation by making an immediate attack in the Sidi Rezegh area. This attack drove the Allies from the field and through the dreadful communication problems the headquarters of the 8th Army learned how its hopeful plans had been disrupted. It was time to use all available reserves to make an all-out attack on Sidi Rezegh again. The preparation for this attack was assisted by Rommel who chose that instant to make one of his characteristic raids deep into the Allied rear, moving through numerous rear areas as he did so. This raid looked serious enough at the time, but it was a serious tactical mistake for he left quite powerful Allied forces still intact in his rear: these were thus able to concentrate again and were soon ready to move on Sidi Rezegh.

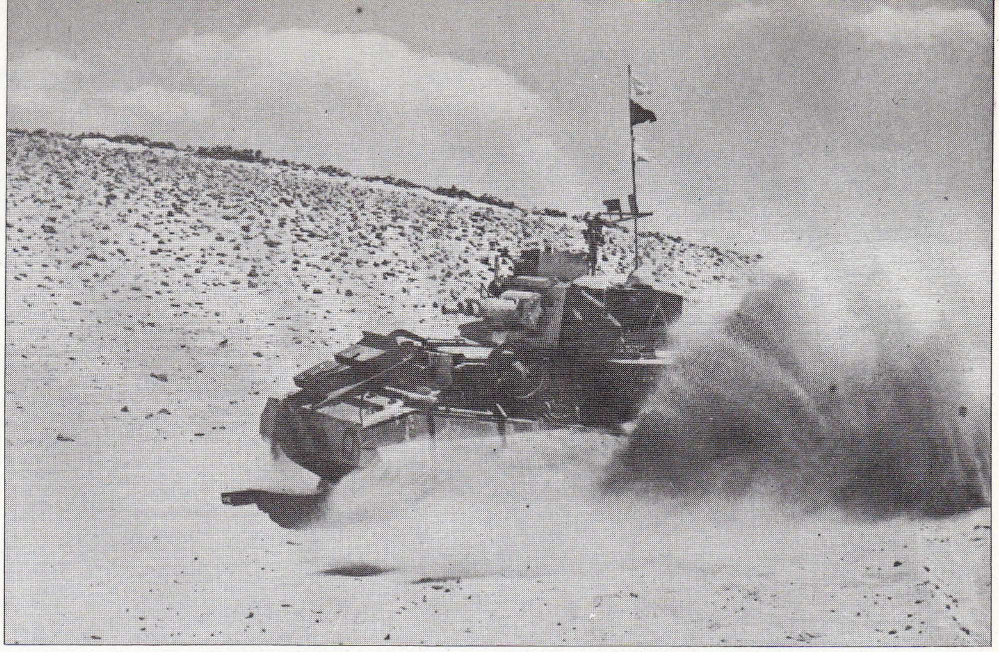
With Rommel's raid finally halted by concentrated artillery (for once), it was time to attack. Yet another counterattack by a Panzer division was made but this time was met by a field battery that literally fought the attackers to the muzzles of their guns and suffered accordingly in the process. But it was enough to knock the Germans off balance and in the slight breathing space more tanks from the reserves arrived for XXX Corps and renewed fighting commenced. These attacks were typical of the period, for time and time again the Allied tanks charged at carefully laid anti-tank defences that decimated their numbers and more than counterbalanced the disparity in the ratio of attackers to defenders. But gradually the Allies moved forward and even linked up with the Tobruk garrison. Once again Sidi Rezegh was in Allied hands.

But it was not for long. In typical style the Germans immediately counterattacked and caught the unprepared Allies off balance. Sidi Rezegh once more changed hands and the link with Tobruk was lost. Again it looked as though Rommel had won, but his gain was illusory. The Allies still had reserves to hand, once they could be organized, and Rommel had none. His armoured raid was seen to be what it had been, a diversion that drew off forces at a vital moment. He had to fall back and, in a series of well-planned well-executed moves, the German and Italian forces withdrew westwards to El Adem and then to El Agheila. This took place in a series of moves that lasted until 6 January 1942 although Operation 'Crusader' had ended well before then.

So Tobruk was relieved, but Operation 'Crusader' had failed in its objective of destroying the enemy armoured forces, which were still intact awaiting their next opportunity to move east to the point where Tobruk would be retaken and only El Alamein would stand before Rommel and the Nile region. The Allies considered they had won a victory, as well they might, but it was a victory that cost them dear. Much of this cost had been caused by their own mistakes: dispersion instead of concentration, headlong attacks against well-defended localities and generally feeding penny packets into a battle instead of waiting for the one all-important blow.

The tanks had not shown up well. Even the new Crusader demonstrated once again that the 2-pdr gun was of little value when pitted against tanks with larger-calibre high-velocity weapons and that its armour offered little protection against such weapons. Even the newly-arrived Stuarts showed that they lacked operational range, and the poor Infantry Matildas and Valentines suffered from the German '88s'.

But the Allies learned from their errors and were much better prepared for the battles to come, battles that were initially defeats but were to lead to eventual victory.



Above: Charging forward, pennants fluttering in the breeze, this Vickers Light Tank Mk VI shows how light armour could be regarded as latter-day cavalry. But the 'Crusader' battles highlighted the need for good inter-arm co-operation. All too often British tank formations suffered heavy losses charging German positions without infantry or artillery support.

Right: The victor: a Cruiser Mk VI Crusader passes a blazing German PzKpfw IV, 27 November 1941. Rommel had 35 Panzer IVs, which were superior to any of the British tanks involved in the battle. To defeat these excellent vehicles with a British Cruiser tank demanded great courage and not a little luck.

Below: Fast, but lacking either the firepower or armour of the German tanks, the imbalance of the Cruiser design had been revealed before 'Crusader', but the troops had to fight with whatever was available – in this case a Cruiser Mk IV.

UK

Infantry Tank Mk IV Churchill

Even to provide a list of all the **Churchill** marks and variants would fill many pages, so this entry can provide only a brief outline of what was one of the most important British tanks of World War II. In production terms the Churchill came second to the Valentine, but in the scope of applications and variants it came second to none.

The Churchill was born in a specification known as the **A20** which was issued in September 1939 and envisaged a return to the trench fighting of World War I. Hence the A20 tank was a virtual update of the old World War I British 'lozenge' tanks, but experiences with the A20 prototype soon showed that a lighter model would be required. Subsequently Vauxhall Motors took over a revised specification known as the **A22** and designed the **Infantry Tank Mk IV**, later named the Churchill.

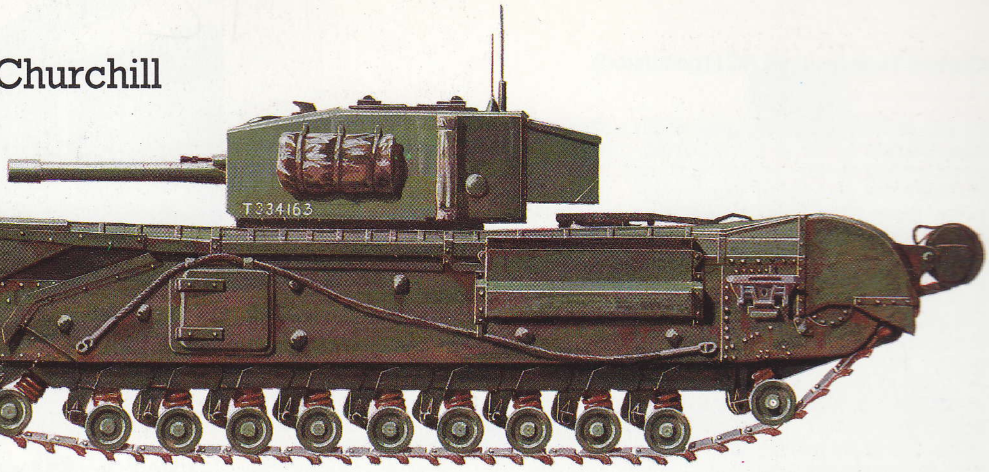
Vauxhall had to work from scratch and yet came up with a well armoured tank with large overall tracks that gave the design an appearance not unlike that of World War I tanks. Unfortunately the early Churchill marks were so rushed into production that about the first 1,000 examples had to be extensively modified before they could even be issued to the troops. But they were produced at a period when invasion seemed imminent and even unreliable tanks were regarded as better than none. Later marks had these early troubles eliminated.

The armament of the Churchill followed the usual path from 2-pdr (**Churchill I-II**), via 6-pdr (**Churchill III-IV**) eventually to a 75-mm (2.95-in) gun in the **Churchill IV (NA 75)** and **Churchill VI-VII**. There were also CS (close support) variants with 76.2-mm (3-in) and eventually 95-mm (actually 94-mm/3.7-in) howitzers in the **Churchill V** and **Churchill VIII**. The Churchill I also had a hull-mounted 76.2-mm (3-in) howitzer. The turrets also changed from being cast items to being riveted or composite structures, and such refinements as track covers and engine cooling improvements were added successively. In all there were 11 Churchill marks, the last three of them 'reworks' of earlier marks in order to update early models to Mk VII standard with the 75-mm (2.95-in) gun.

In action the heavy armour of the Churchill (16-102 mm/0.6-4 in in Mks I-VI and 25-152 mm/1-6 in in Mks VI-VIII) was a major asset despite the fact that the tank's first operational use was in the 1942 Dieppe landings, when many of the Churchills used proved unable to even reach the beach, let alone cross it. But in Tunisia they proved they could climb mountains and provide excellent support for armoured as well as infantry units, though they were often too slow to exploit local advantages.

It was as a special-purpose tank that the Churchill excelled. Many of these special variants became established as important vehicles in their own right, and included in this number were the **Churchill AVRE** (Armoured Vehicle Royal Engineers), the **Churchill Crocodile** flamethrower tank and the various **Churchill Bridgelayer** and **Churchill Ark** vehicles. Then there were the numerous Churchill mine-warfare variants from the **Churchill Plough** variants to the **Churchill Snake** with its Bangalore torpedoes. The Churchill lent itself to all manner of modifications and was able to carry a wide assortment of odd gadgets such as wall demolition charges (**Churchill Light Carrot, Churchill Onion** and **Churchill Goat**) mine-clearing wheels (**Churchill AVRE/CIRD**), carpet-laying devices for use on boggy ground (**Churchill AVRE Carpetlayer**), armoured recovery vehicles (**Churchill ARV**), and so on.

The Churchill may have looked archaic, but it gave excellent service and many were still around in the mid-1950s in various guises, the last Churchill AVRE not being retired until 1965.



Above: The Churchill was essentially designed for a return to trench warfare. As such it was a classic infantry tank, slow but heavily armoured. Introduced in 1943, its chassis was subsequently used for a host of specialist vehicles.

Left: Churchills move up to the Normandy front line past a column of US M4 Shermans in early August 1944. Note how the crews have attached large sections of track to the front hull and the turret side as additional armour.

Specification

Churchill VII

Crew: 5

Weight: 40642 kg (89,600 lb)

Powerplant: one Bedford twin-six petrol engine developing 261 kW (350 bhp)

Dimensions: length 7.442 m (24 ft 5 in); width 2.438 m (8 ft); height 3.454 m (11 ft 4 in)

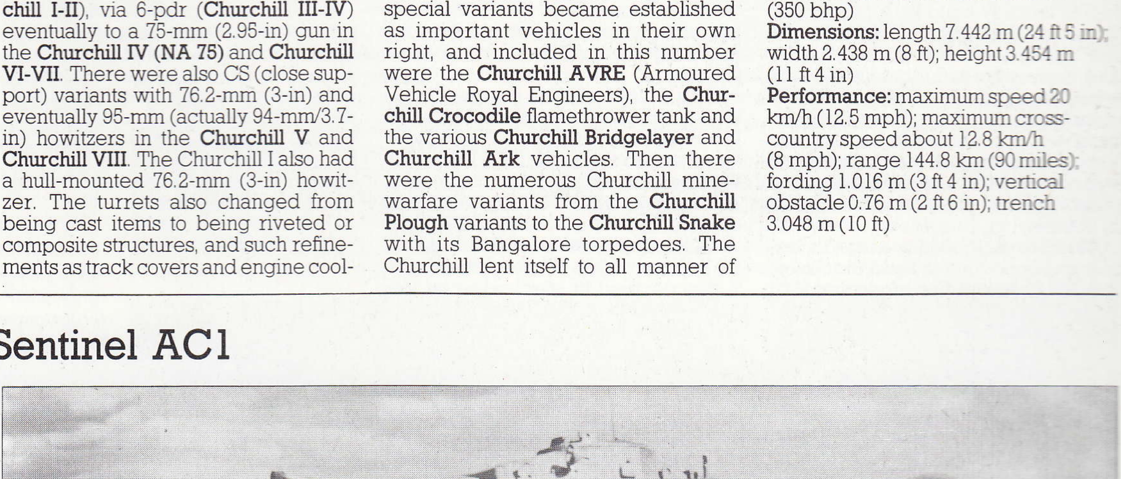
Performance: maximum speed 20 km/h (12.5 mph); maximum cross-country speed about 12.8 km/h (8 mph); range 144.8 km (90 miles); fording 1.016 m (3 ft 4 in); vertical obstacle 0.76 m (2 ft 6 in); trench 3.048 m (10 ft)

AUSTRALIA

Cruiser Tank Sentinel AC1

In 1939 Australia's armed forces had virtually no modern tanks and lacked almost any form of heavy engineering background to produce them; even an automobile industry was lacking. Nevertheless the Australian government realized that it was unlikely that any large amounts of heavy war matériel would be available to Australia from overseas, and so set to to produce its own. Among the requirements were tanks, and as there was no local expertise on the subject one engineer was sent to the United States and an experienced engineer was obtained from the United Kingdom.

With this experience to hand the Australian army staff issued a specification and Australian industry set to with a will. The first design, known as the **AC1 (Australian Cruiser 1)** was to have a 2-pdr (40-mm/1.57-in) gun and two



The outbreak of war found Australia with no modern tank force and little industrial infrastructure. The AC1 Sentinel was a home-grown tank developed at lightning speed to fight off the anticipated Japanese invasion.

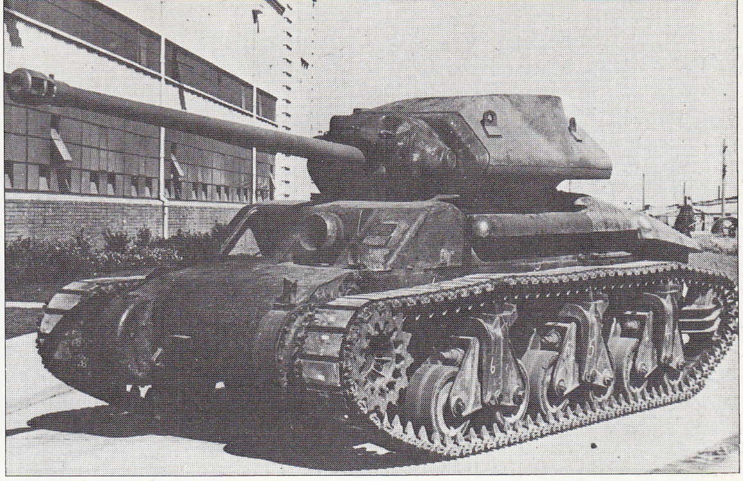
Cruiser Tank Sentinel AC1 (continued)

7.7-mm (0.303-in) machine-guns, and it was decided to use as many components of the American M3 tank as possible. The powerplant was to comprise three Cadillac car engines joined together and extensive use was to be made of cast armour. A second model, to be known as the **AC2**, was mooted, but by late 1941 as the Japanese became increasingly aggressive in the Pacific, the AC2 was passed over in favour of the existing AC1, which had armour ranging from 25 mm (1 in) to 65 mm (2.55 in) in thickness.

The first AC1s were ready by January 1942 and were soon named **Sentinel**. The whole project from paperwork requests to hardware had taken only 22 months, which was a remarkable achievement since all the facilities to build the tank had to be developed even as the tanks were being built. But only a few AC1 tanks were produced as by 1942 it was realized that the 2-pdr gun would be too small to have any effect against other armour and anyway, the hurried design still had some 'bugs' that had to be modified out of the design. Most of these bugs were only minor, for the Sentinel turned out to be a remarkably sound design capable of considerable stretch and modification. This was just as well, for the **Sentinel AC3** mounted a 25-pdr (87.6-mm/3.45-in) field gun barrel in the turret to overcome the shortcomings of the 2-pdr.

The 25-pdr was chosen as it was already in production locally, but it was realized that this gun would have only limited effect against armour and the **Sentinel AC4** with a 17-pdr (76.2-mm/3-in) anti-tank gun was proposed and a prototype was built. This was during mid-1943, and by then the background to the hurried introduction of the AC1 into service had receded. There was no longer the chance that the Japanese might invade the Australian mainland and anyway, M3s and M4s were pouring off the American production lines in such numbers that there would be more than enough to equip all the Allies, including Australia. Thus Sentinel production came to an abrupt halt in July 1943 in order to allow the diversion of industrial potential to more important priorities.

The Sentinel series was a remarkable one, not only from the industrial side but also from the design viewpoint. The use of an all-cast hull was way ahead of design practice elsewhere, and the ready acceptance of heavy guns like the 25-pdr and the 17-pdr was also way ahead of contemporary thought. But the Sentinel series had little impact at the time for the examples produced were used for training only.



In spite of the speed with which it was produced, the AC1 Sentinel was a remarkably innovative design featuring an all-cast hull and a heavy armament. This is the Mk IV, which mounted a 17-pdr gun.

Specification
Sentinel AC1
Crew: 5
Weight: 28450 kg (62,720 lb)
Powerplant: three Cadillac petrol engines combined to develop 246 kW (330 bhp)
Dimensions: length 6.325 m (20 ft 9 in); width 2.768 m (9 ft 1 in); height 2.56 m (8 ft 4.75 in)
Performance: maximum speed 48.2 km/h (30 mph); range 322 km (200 miles); trench 2.438 m (8 ft)

CANADA

Cruiser Tank Ram Mk I

When Canada entered World War II in 1939 it did not have any form of tank unit, and the first Canadian tank training and familiarization units had to be equipped with old World War I tanks from American sources. However, it was not long before the Canadian railway industry was asked by the UK if it could manufacture and supply Valentine infantry tanks, and this proved to be a major task for the Canadians who had to virtually build up a tank manufacturing capability from scratch. But the Valentines were 'Infantry' tanks and the new Canadian tank units would need 'Cruisers' for armoured combat. At that time there was little prospect of obtaining tanks from the United Kingdom and the United States was not involved in the war, so the only thing to do was design and build tanks in Canada.

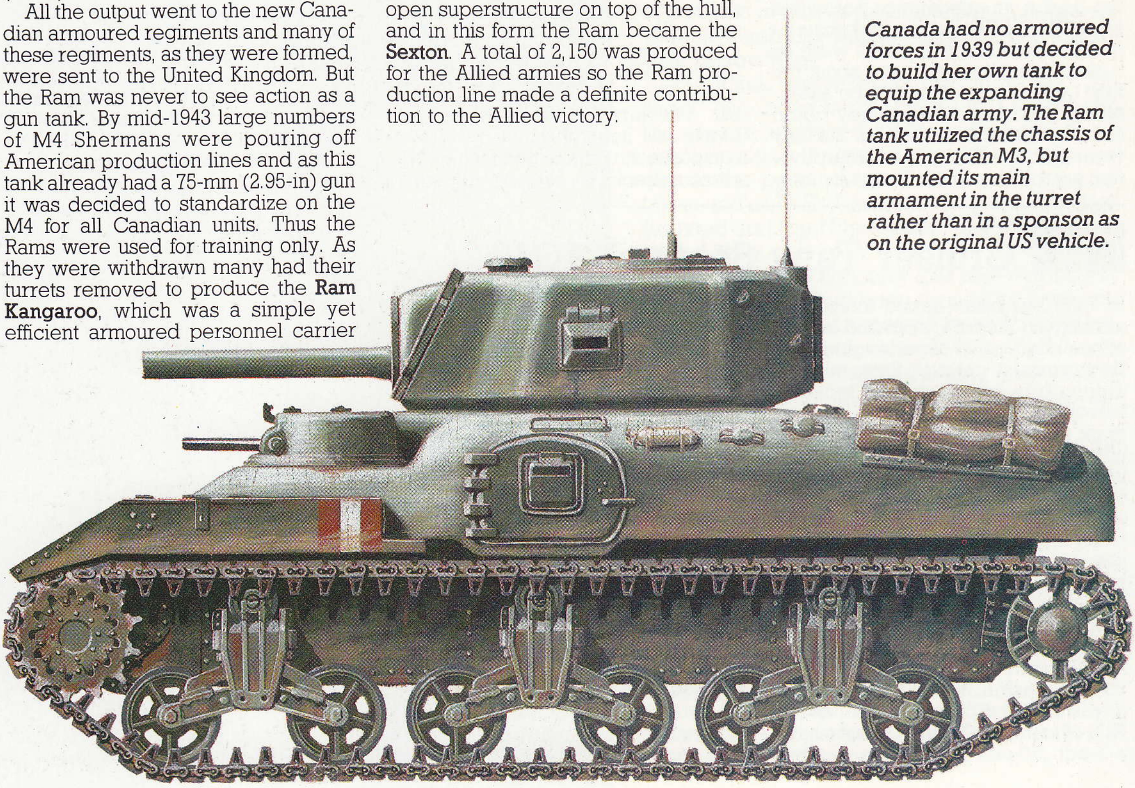
But what tank? Again, at the time it seemed opportune to build the American M3 (then entering production for a British order) but this design, later known as the Grant/Lee, had the drawback of a sponson-mounted main gun at a time when it was appreciated that a turret-mounted gun was much more efficient. Thus the Canadians decided to adopt the main mechanical, hull and transmission components of the M3, but ally them to a new turret mounting a 75-mm (2.95-in) main gun. But there was no prospect of a 75-mm (2.95-in) gun at the time, so the readily-available (40-mm/1.58-in) weapon was chosen for initial installations, with the chance of fitting a larger gun later. This turned out to be the 6-pdr (57-mm/2.244-in) gun.

Building such a tank from scratch was a major achievement for Canadian industry, and the prototype was rolled out from the Montreal Locomotive Works in late June 1941. It was christened the **Cruiser Tank Ram Mk I**, and turned out to be a remarkably workmanlike design making much use of cast armour; the drive train and suspension demonstrated its M3 origins. It was not long before the initial 2-pdr gun was replaced by a 6-pdr in the **Ram Mk II**, and production proper got under way by the end of 1941. The secondary armament was one co-axial and one hull-mounted 7.62-mm (0.3-in) machine-gun. Almost as soon as production commenced numerous design modifications were progressively introduced but none of these changes were fundamental as the Ram was a basically sound tank. Armour thickness ranged from 25 mm (1 in) to 89 mm (3.5 in).

All the output went to the new Canadian armoured regiments and many of these regiments, as they were formed, were sent to the United Kingdom. But the Ram was never to see action as a gun tank. By mid-1943 large numbers of M4 Shermans were pouring off American production lines and as this tank already had a 75-mm (2.95-in) gun it was decided to standardize on the M4 for all Canadian units. Thus the Rams were used for training only. As they were withdrawn many had their turrets removed to produce the **Ram Kangaroo**, which was a simple yet efficient armoured personnel carrier widely used in the post-June 1944 campaigns. Some Rams had their guns removed and were used as artillery observation posts (**Ram Command/OP Tank**), while others were more extensively modified to become armoured recovery vehicles. Some were used for various experimental and trial purposes, such as the mounting of a 94-mm (3.7-in) anti-aircraft gun on top of the hull.

But the Ram's greatest contribution to the conflict was the adaptation of the basic Ram hull to take a 25-pdr artillery piece. The gun was placed in a simple open superstructure on top of the hull, and in this form the Ram became the **Sexton**. A total of 2,150 was produced for the Allied armies so the Ram production line made a definite contribution to the Allied victory.

Specification
Ram Mk II
Crew: 5
Weight: 29484 kg (65,000 lb)
Powerplant: one Continental R-975 radial petrol engine developing 298 kW (400 bhp)
Dimensions: length 5.79 m (19 ft 0 in); width 2.895 m (9 ft 6 in); height 2.667 m (8 ft 9 in)
Performance: maximum speed 40.2 km/h (25 mph); range 232 km (144 miles); vertical obstacle 0.61 m (2 ft); trench 2.26 m (7 ft 5 in)



Canada had no armoured forces in 1939 but decided to build her own tank to equip the expanding Canadian army. The Ram tank utilized the chassis of the American M3, but mounted its main armament in the turret rather than in a sponson as on the original US vehicle.

US Army

Part 6

The value of helicopter-borne troops was proved in South East Asia, and it was a Vietnam-style combat assault that spearheaded the recent liberation of Grenada. Here men of the 82nd Airborne Division board a Sikorsky UH-60A Black Hawk, the replacement for the popular Bell UH-1.

Army Aviation

Currently involving close to 9,000 fixed-wing aircraft and helicopters, United States Army aviation activities form only a fairly small part of US Army endeavours as a whole. Nevertheless, a sizable proportion of the annual budget is devoted directly to aviation, which is quite rightly seen as a most important adjunct to forces operating on the ground. From the point of view of operations, US Army aviation has come a long way since the start of the Vietnam War, and it is fair to say that this conflict had a powerful and far-reaching effect on philosophy with regard to the employment of aviation assets.

Before the massive US involvement in Vietnam, US Army aviation had been employed principally as a means of enhancing mobility, most of the helicopters operated being used as troop carriers or for the rapid movement of equipment such as artillery, ammunition and other necessary supplies. As such they were lightly armed (if at all), but combat experience in South East Asia soon showed that the helicopter was in fact a most vulnerable machine, many of these aircraft falling victim to ground fire during the insertion and withdrawal phases of an operation. In view of this, urgent attention was directed towards the development of an armed and armoured helicopter, the resulting Bell AH-1G HueyCobra entering service during the latter half of the 1960s and quickly proving itself to be a most valuable addition to the inventory. Since then, armed helicopters have been assigned to virtually all of the major US Army commands throughout the world, and it would now be inconceivable for the US Army to be committed to battle without their support.

Despite the fact that the US Army now possesses a most powerful attack capability, the primary mission of providing support to combat echelons operating on the field of battle remains unchanged. This mission embraces a multitude of tasks, and the US Army is therefore equipped with a variety of helicopters in order that the various specialized duties can be accomplished satisfactorily. Such types include the Boeing Vertol CH-47 Chinook for heavy-lift duties, the Bell OH-58 Kiowa for scouting and observation tasks, the Bell AH-1S HueyCobra and Hughes AH-64 Apache gunships, and the Bell UH-1H and Sikorsky UH-60A for utility functions, the latter pair being what might best be described as 'maids of all work'. In addition, some fixed-wing aircraft are also operated, most being engaged on communications and liaison tasks but some (such as the Grummman RV-1D Mohawk and the Beech RU-21 Ute) are employed as reconnaissance and electronic surveillance platforms.

From the standpoint of organization, the US Army is broken down into four individual major commands. Two of these (the 1st Army at Fort Meade, Maryland, and the 6th Army at Presidio, California) are based in the continental USA whilst the remaining two are located overseas, these being the 7th Army at Heidelberg, West Germany, and the 8th Army at Youngsan, South Korea.

Subordinate divisions, of which there are 16 in all, are attached to these, although the distribution is by no means equal. By way of illustrating force composition, USAREUR's (US Army Europe) 7th Army has two mechanized infantry and two armoured divisions, whilst the 8th Army in Korea is a much smaller organization, controlling just one infantry division.

Although the division is the basic combined-arms formation, it is the battalion which serves as the principal manoeuvre unit, such units fighting as part of a brigade. Each division has three brigade headquarters, the latter controlling from three to five battalions.

With regard to manoeuvre forces, most divisions incorporate a combat aviation battalion (CAB), and this is certainly true in Europe where each of the heavy divisions has such a unit. Typically, a CAB comprises 42 AH-1S HueyCobra, 48 OH-58 Kiowa and 23 UH-1H Iroquois helicopters, these undertaking such tasks as reconnaissance, anti-tank warfare and minelaying. To facilitate operational control of these potentially unwieldy forces, a CAB is further subdivided into four companies: 'A' Company is principally concerned with combat support and is equipped with 16 UH-1Hs and 24 OH-58s; 'B' and 'C' Companies form the principal cutting edge of the CAB, each possessing three UH-1Hs, 12 OH-58s and 21 AH-1Ss; and 'D' Company is responsible for maintenance and this has on charge a single UH-1H, whilst it also usually keeps one spare example of each helicopter type employed by the battalion.

Additionally, both European-based armoured cavalry regiments also have an attached attack helicopter company, and these are equipped in a similar fashion to the attack companies of the combat aviation battalions. Infantry divisions also normally incorporate several troop-lift helicopter companies in order to enhance mobility, many of these now being in process of re-equipment with the UH-60A Black Hawk although the trusty UH-1H Iroquois also remains in widespread service.

Further aviation assets include a number of non-assigned aviation companies undertaking tasks which include assault support, reconnaissance, surveillance and medical evacuation, types in use including the CH-47 Chinook, the RV-1 Mohawk and the UH-1H Iroquois. Finally, it is by no means uncommon for artillery and engineer regiments to operate a few helicopters, these being mainly employed in support functions.

Now in the process of a major modernization effort, the US Army is taking delivery of two relatively new types of helicopter in the shapes of the UH-60A Black Hawk and the AH-64A Apache, but further updating is also being achieved by means of a CILOP (Conversion In Lieu Of Procurement) programme which entails the virtual remanufacture of

The Hughes AH-64 Apache mounts a fearsome array of weaponry, with a Hughes 30-mm chain gun and either 16 Hellfire anti-tank missiles or up to 76 unguided rockets. It is the most powerful helicopter gunship in the world and, priced at $10 million, also the most expensive.

12 PASS

US Army medium- and heavy-lift duties are now entrusted solely to the 450 or so Boeing CH-47 Chinooks, which are all planned to be modernized to CH-47D standard. Upengined and with improved crash survivability, the CH-47D can also carry a much greater payload.

existing CH-47A, CH-47B and CH-47C Chinooks to CH-47D configuration, well over 400 examples being due to receive this treatment in the next few years.

As far as armed helicopters are concerned, the AH-1S HueyCobra still occupies a position of ascendancy, several hundred remaining in service, many of them modernized machines arising from an updating programme which entailed the addition of the TOW wire-guided anti-tank missile. Other improvements embodied in the AH-1S include non-reflective flat-plate canopy glass, uprated engines and transmission units, composite rotor blades and improved nav/com gear, whilst some new-build machines feature an updated gun turret, compatible with either 20-mm or 30-mm cannon armament. In addition, Bell has also built just over 100 modernized AH-1S helicopters which possess a new fire-control system, Doppler navigation, infra-red suppression/jamming and secure voice communications gear.

Looking to the future, the somewhat grotesque Hughes AH-64A Apache will become the principal attack helicopter and this is now in quantity production at Mesa, Arizona. Present planning calls for the acquisition of close to 500 examples of this fearsomely armed machine, deliveries of which began quite recently. Capable of carrying no less than 16 Hellfire anti-tank missiles, the Apache comes complete with a Hughes XM230E1 30-mm chain gun which has a normal firing rate of 800 rounds per minute. Additionally, the Apache can carry up to 76 unguided rockets, whilst the provision of sophisticated target acquisition and night vision systems permit it to operate effectively by day and night or in adverse weather conditions.

On the utility helicopter front, Sikorsky's highly versatile UH-60A Black Hawk is now well established in service, about half of the planned procurment of 1,107 having been delivered. Examples of the Black Hawk are presently operational in the USA and Europe, but plans to acquire the EH-60B SOTAS (Stand-Off Target Acquisition System) variant have been abandoned because of the high cost of mission-related avionics. Nevertheless, this requirement still exists and it is not inconceivable that the project could be resurrected at some future date.

The backbone of US Army aviation for many years, Bell's equally versatile 'Huey' remains in widespread service today and is still the most numerous type in the inventory, being found everywhere that the US Army maintains a presence. The principal front-line model is the UH-1H which undertakes a multitude of missions, but older variants are still around in some numbers, most being assigned to second-line forces within the continental USA.

The next most numerous type is the OH-58 Kiowa, and this too is being subjected to modernization, many of the 2,200 examples acquired in the late 1960s being earmarked for conversion to OH-58C standard with flat-plate canopies, an uprated engine, infra-red suppression and improved nav/com equipment. Operationally, the OH-58 fulfils a variety of tasks but its prime function is that of scout helicopter, and it usually works in harness with the rather more lethal attack helicopters. Another type employed as a scout helicopter is the Hughes OH-6A Cayuse, but this is numerically rather less important, only about 400 or so being in service and most, if not all, are based within the boundaries of the USA.

US Army medium- and heavy-lift capability is now entrusted solely to the CH-47 Chinook, all remaining examples of the Sikorsky CH-54 Tarhe having been relegated to second-line service with reserve echelons. As already noted, Chinook modernization efforts have resulted in the advent of the CH-47D variant which is substantially more powerful than earlier derivatives, and plans are in hand to upgrade more than 400 older Chinooks in the next 10 years or so. Recently introduced to service with the 101st Airborne Division, the CH-47D incorporates new engines, composite rotor blades, an advanced automatic flight control system and increased crashworthiness, features which combine to enhance payload by a quite remarkable degree; the Chinook can now carry 44 fully-equipped troops instead of the 33 that was normal with earlier examples. About 450 Chinooks at present serve with the US Army throughout the world.

In addition to the types already discussed, US Army aviation also includes a sizable fleet of fixed-wing aircraft, the majority of which are assigned to support duties. Such types include the Beech T-42A Cochise, Beech U-21 Ute, Beech U-25/C-12 Huron and Beech U-8 Seminole. Heavily modified variants of the U-21 and C-12 are also assigned to such specialist tasks as electronic surveillance and the acquisition of signals intelligence, whilst about 150 OV/RV-1 Mohawks perform reconnaissance. Finally, primary helicopter training is accomplished with the Hughes TH-55A Osage, some examples of the Cessna T-41 Mescalero also being engaged on fixed-wing flying training duties.

Flying fast and low, the door gunner leaning out over the 2.75-in rocket pod, this Bell UH-1N of the 24th Composite Squadron is on a close-support mision during an exercise near the Panama Canal.